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ABSTRACT

This activity guide provides children in grades kindergarten through six with hands-on learning experiences while they nurture an acorn into a young oak tree. Each of 10 activities and numerous extensions help students gain awareness, understanding, and appreciation of the important role oaks play in the natural and cultural history associated with the California landscape. The activities build on themes, concepts, and learning processes outlined in school district and state-adopted curriculum frameworks. Curriculum connections are made with science, social studies, language arts, mathematics, and the arts. In addition, the skills of learning, such as being able to make observations, comparisons, and inferences, and to organize, relate, apply, and communicate information are built into each activity. The guide contains an introduction with suggestions for implementing the project, a checklist of materials needed, and recommended assessment method. Each of 10 activities contains objectives, methods, curriculum materials, background information, activity procedures, follow-up activities, evaluation methods, references, and worksheets. Three appendices contain suggestions for: (1) encouraging student observation and information gathering; (2) planning a tree-planting ceremony; and (3) agency, organization, and additional materials resources (25 entries). (LZ)

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Seed to Seedling

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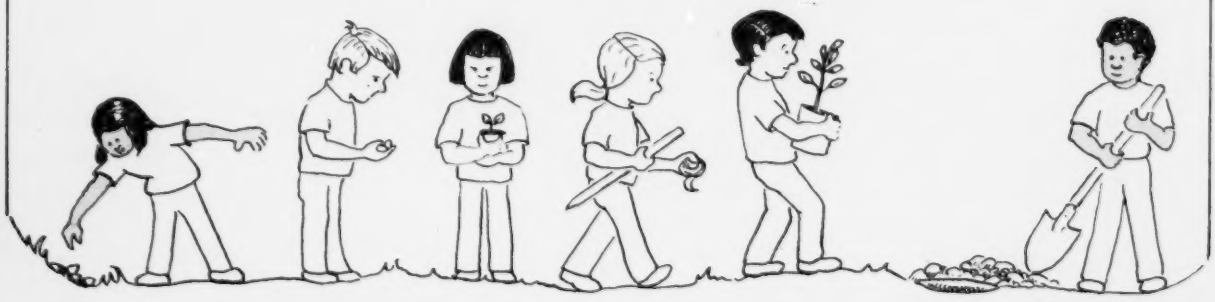
A California Native Oak Curriculum

for

Kindergarten through Sixth Grade Children

by

The Sacramento Tree Foundation



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SEED TO SEEDLING: A California Native Oak Curriculum for Kindergarten to 6th Grade Children.

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SACRAMENTO Tree FOUNDATION

The Sacramento Tree Foundation is a non-profit organization dedicated to citizen tree planting, stewardship, and education in the greater Sacramento area.

The California Oak Foundation supports this effort toward educational awareness of California native oaks.

Chevron

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Preface

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Seed to Seedling was written during 1985, "Year of the Oak" in Sacramento County. Funding was provided to the Sacramento Tree Foundation through grants from the Sacramento County Parks and Recreation Committee, and the California Department of Forestry and Fire Protection-Urban Forestry program sponsored an expansion of the curriculum to include the "Oaks of the Urban Forest" activities. These earlier versions of *Seed to Seedling* featured activities to help children learn about and grow oaks found in the Sacramento Valley.

As interest in teaching children about oaks has spread statewide, so have requests to use and adapt the original materials. Recognizing a need to both improve and expand *Seed to Seedling*, in 1990 during California's "Year of the Oak," the Sacramento Tree Foundation received a grant from the Chevron Companies, enabling a complete revision of the curriculum. At the same time, the California Oak Foundation agreed to help distribute and encourage the use of *Seed to Seedling*.

Over the years, many Sacramento County teachers, youth leaders, oak experts and enthusiasts have generously provided their insight and evaluation of *Seed to Seedling*. Their ideas and suggestions have been incorporated into this new edition. A very special thanks to Pam Bone, Meg Burgin, Everett Butts, Austin Carroll, Vince Conrad, Katy Darlington, Jim Geiger, Karen Hatchel, Sally Jervis, Amy Kaplan, Ann Kohl, Barbara Mantzouranis, Betty Matyas, Verna Newman, Warren Roberts, Ray Tretheway, Mike Weber, and Tom and Betsy Whitney. During the revision process, valuable new information, ideas and comments were provided by Marge DeStaebler, Barbara Hopper, Doug McCreary, Pam Muick, Jeanette Needham, Ruth Ortiz, Adrienne Scott, Kay Slagle and Ginger Strong.

Preface

Seed to Seedling is dedicated to my family, Erik, Lucia and Mariana Antunez de Mayolo, who all, so patiently, allowed me the time and energy to devote to this project and have helped to gather, plant and care for thousands of acorns that are growing into new oaks.

Kay Antunez de Mayolo

Introduction

"I believe that the trees I have planted have given me 10 years of new life. They have transformed the land and me at the same time. In as much as I can help one or two children experience this, I feel as if I have done something worthwhile in my life."

Rene Dubos

Seed to Seedling activities provide children with many hands-on learning experiences while they nurture an acorn into a young oak tree. Each of the 10 activities and many extensions help them gain an awareness, understanding and appreciation of the important role oaks play in the natural and cultural history associated with the California landscape.

The activities build on themes, concepts and learning processes outlined in school district and state-adopted curriculum frameworks. There are many curriculum connections with science, social studies, language arts, mathematics and the arts. In addition, the skills of learning, being able to make observations, comparisons, inferences, and to organize, relate, apply and communicate information are built into each activity.

Helping children to nurture a new tree also shows them how they can play a role in caring for the environment. On one level, by growing, caring for and planting an oak, children begin to understand what is required to grow trees. Is also allows them to take responsibility for a living thing. These activities can help children develop the foundation for a lifelong interest in the natural world and enable them to understand how their choices and actions affect the environment.

In addition, *Seed to Seedling* activities can provide opportunities for children to:

- Work cooperatively with other children and adults.
- Practice important communication skills, especially those needed by children with limited proficiency in English.
- Gain a sense of personal success after conducting a long-term project.
- Participate in a project that will benefit their community and local environment.

Introduction

How to Implement the *Seed to Seedling* Project

Seed to Seedling activities can be used (or modified!) by kindergarten through sixth-grade teachers and youth leaders over a period of six to nine months. In the fall, children can begin to gather acorns, learn how to identify oaks and begin to plant acorns in containers or directly in the ground.

Over the years, many teachers have told us that they prefer to wait until after the December holidays to begin this project. In this case, the acorns must be kept cool and moist. During this period, some species of oaks begin to sprout, so take care not to damage their roots.

If acorns are planted in containers during the fall, the seedlings will be ready to plant outside by the early spring. Wherever they are planted, these young trees need to be watered and cared for during the next three years in order to ensure their survival. Acorns planted in winter (December to late January) will need to be kept in their containers until the following year or if planted, must be cared for during the summer. Be sure to consider these needs when deciding upon a planting schedule. It's important to think about where the children will plant their trees or who will take the trees if no location is found to plant them.

While waiting for the acorns to germinate, you may choose to do several activities that explore techniques and ideas such as seedling care, evaluating "Heritage Oaks" and the important relationships of oaks and wildlife. Children can investigate soil and even make soil to plant their acorns.

Several excellent science and environmental education materials are cross-referenced with each *Seed to Seedling* activity. *Project Learning Tree*, *Project WILD*, *OBIS* (Outdoor Biology Instructional Strategies) and *NatureScope* activities can help extend and strengthen the concepts introduced by the *Seed to Seedling* activities.

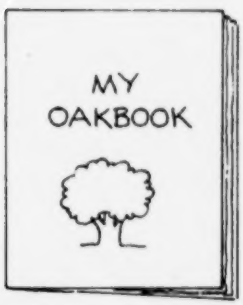
You may want to find an "oak expert" to help you with this project. Many chapters of the California Native Plant Society and local groups representing the California Oak Foundation and California ReLEAF are available to work with your group. Some of these groups gather and store acorns to share with children. Ask about guest speakers or docent programs they may have to assist you. Check Appendix 3 for names of groups that may be able to help you.

Checklist of material needed

- ✓ Soil; about 2 cubic feet per group of 30 children.
- ✓ Growing containers; recycled milk cartons (quart or half-gallon size, but NOT school milk cartons), 1-gallon nursery pots or #10 cans.
- ✓ Water-proof tray (baking pan, lunchroom tray, etc.), plastic tablecloth or cover, paper towels, sponges to collect and control water draining from containers.
- ✓ Source of acorns (Refer to Appendix 3 for names of organizations that can assist in locating a source of acorns).
- ✓ Sources of water and light; good growing temperature (65-85°F).
- ✓ Places to plant small seedlings so that they can grow into large, healthy oak trees.

ASSESSMENT

It is recommended that each child develop an "OakBook." This folder or portfolio of notes, activity and data sheets, drawings and other materials can help children keep track of their *Seed to Seedling* project over the extended period of time it will take for the seedlings to grow. The "OakBook" can provide a sense of continuity as well as help children review and evaluate their own understanding of important concepts and information developed by the activities. Teachers can use the "OakBook" as a type of "authentic assessment" in order to check each student's progress and performance while conducting this project.



ACTIVITY 1: Learning to Identify California Native Oaks

OBJECTIVE:

Children learn how to recognize and identify California native oaks.

METHOD:

Either in a classroom or outside setting (preferably with oaks in view), children observe, compare and describe the unique characteristics of native oaks using leaves and acorns to complete the activity sheet.

CURRICULUM CONNECTIONS:

science, language arts, social sciences

BACKGROUND:

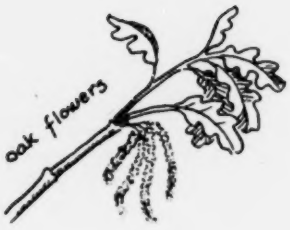
Oak trees are a prominent feature of California's landscape. They are part of the oak woodland--grassland habitat type. Found on rolling hills, along rivers, creeks and in valleys of 52 of the state's 58 counties, oaks provide an image widely known and loved by Californians.

Unfortunately, the habitats in which these native trees grow are decreasing. Historical accounts describe how the once-dense stands, covering an estimated 10 million acres, formed an impressive canopy over the state. During the past 200 years, changes in use of land and its resources have vastly altered the oak habitat. In many areas of California, oaks are having difficulty regenerating.

There is still a lot to understand about the process of natural regeneration of oaks. Since they live so long (100-300 years), they operate on a different time scale than humans are used to. Each tree needs to produce one replacement tree in its lifetime for a forest or woodland to remain as a stable landscape. However, oak seedling mortality is so high (this is true of all plant species), hundreds and thousands of acorn seedlings are generated in the normal course of an oak's life span.

Seedlings may die from many causes, such as disease, drought and browsing both above and below the ground. Although livestock and machines have obvious negative effects on oak seedlings, in most environments these effects are not uniform. Other environmental factors that affect oak seedling survival include fire, surrounding vegetation, micro-site location, insects, deer and other grazing wildlife. Oak regeneration is a process influenced by almost every part of the environment.

ACTIVITY 1: Learning to Identify California Native Oaks



Fortunately, oaks are easy to grow! Taking lessons from the scrub jay, we can learn to collect and nurture acorns into new oaks. That's what *Seed to Seedling* is all about. To begin this project, help children become aware of the oaks found in your part of the state. California has 18 native oak species: 10 tree and 8 shrub. Oaks are known to hybridize; more than 20 crosses are recognized by oak specialists. Even the most familiar oaks exhibit a wide range of distinguishing characteristics. This makes identification of oak species a challenge even for the experts.

The chart found at the end of this activity summarizes key features and range of distribution for eight California oaks. These are the most common. For more detailed descriptions, use the references listed at the end of this activity.

ACTIVITY PROCEDURE:

grades: K-6
time: 60 minutes
materials:
- ✓ *slides or photographs of oaks*
- ✓ *preserved specimens of acorns and leaves*
- ✓ *fresh leaves and acorns*
- ✓ *identification and activity sheets (reproduce one for each child)*

skills:
- *observe*
- *communicate*
- *compare*
- *organize*
- *analyze*

Introduce children to oaks by showing them examples of acorns and leaves. If oaks are nearby, first-hand observations are the best way to get to know these trees. Show pictures of trees if live trees are not available.

Using leaf and seed samples, help children learn to distinguish oak trees from other trees. Hand lenses are helpful to look at leaf edges and surfaces. Discuss the characteristics of oaks from your region. Try these questions:

- What makes a blue oak look blue? Try rubbing off the bluish wax of the leaf surface to prove they are really blue.
- Can you find the hairs on a coast live oak leaf? Look on the leaf's undersurface and along edges.
- Why do some oak leaves have spiny edges? Does it protect the tree from predators?
- How are oak leaves different from (or the same as) other leaves?
- Can you describe an oak's flower? (It's tassel-like.)

Notice the difference in acorn caps. Some are "warty," while others are scaly like "shingles" on a roof. These are useful characteristics that can be used to identify oak species.

ACTIVITY 1: Learning to Identify California Native Oaks

Provide children with a copy of "Acorn and Oak Leaf matchup." Working independently or in small groups, ask the children to identify their leaves by matching leaf samples and pictures. Exact matches are rare! Point out that living things (even people) come in a wide range of sizes and shapes.

Finally, children can complete the oak identification sheet and use it to review their success in understanding the activity. Did everyone have the same kind of leaves? Take a census.

Ask children to include the activity sheet in their "OakBook."

FOLLOW-UP ACTIVITIES:

- Begin collecting news articles about oak trees. Display them on a classroom bulletin board.
- Observe oaks growing on school grounds. Find out what kind (species) they are.
- Map the oaks and other trees found on the school grounds.
- See "Oak Watch Ideas" in Appendix 1.
- Make a leaf collection from oaks and other trees found around school or at home.
- Make a collection of different kinds of acorns.
- To preserve oak leaves, place them between two sheets of clear contact paper. These can also be used to make leaf rubbings.
- Use blueprint or other light-sensitive paper to make "sunprints" of oak leaves.
- Find out how oaks were used by early Californians.
- Study the ecology of oak woodlands, riparian (river bank) areas, and valley grasslands, places where oak trees are still found today.
- Try *Project Learning Tree* activities: "Adopt a tree," "Leaf Hunt Relay," "Leaf Prints," and "Tree Shapes, Natural and Unnatural."
- Try *Project Wild* activities: "Who Lives Here?" and "Wild Words."
- Try *NatureScope: Trees are Terrific:* "Keying Out Trees."

ACTIVITY 1: Learning to Identify California Native Oaks

EVALUATION:

Children are successful with the task of identifying oak samples. They complete the activity sheets and include it in their "OakBook."

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ACTIVITY 1: Learning to Identify California Native Oaks

Native Oaks of California

Species	Habitat	Distribution	Identifying Characteristics
Coast Live Oak, Encina *Quercus agrifolia* 	Coastal hillsides, lower mountain slopes and canyons	Common in coastal regions; Northern Baja California to southern Mendocino County below 5000 ft.	Evergreen tree with broad rounded shape; 50-100 ft. tall. Leaves leathery, holly-like, 1-3 in. long, with tufts of brown fuzz along the midrib and side veins. Leaf edges often curled under, spiny. Acorns slender, pointed, cup deep, flat scales (shingle like).
California Black Oak *Quercus kelloggii* 	Moist woodlands, mixed evergreen and coniferous forests	San Diego County to Oregon, 1000-8000 ft.	Deciduous tree with stout trunk, bowed branches, rounded crown; to 80 ft. tall. Leaves large, 3-8 in. long, deep lobes, dark green, edges tooth lobed with bristle. Acorns 1-1½ in. long; cup deep, flattened scales.
Interior Live Oak *Quercus wislizenii* 	Moist mixed evergreen forests of North Coast ranges, dry valleys and foothill woodlands surrounding the central valley and interior southern California	Northern Baja California to Shasta and Siskiyou counties, 1000-5000 ft.	Evergreen tree with short or multiple trunk and broad rounded crown, 10-75 ft. tall. Leaves 1-2 in. long, flat, stiff, shiny, spiny or smooth edges, but not hairy. Acorns, 3/4 to 1½ in. long, conical, flat scales. Often confused with coast live oak, with which it hybridizes.
Engelmann Oak Mesa Oak *Quercus engelmannii* 	Oak woodlands; replaces blue oaks in San Diego Co.	Northern Baja to Los Angeles County (Pasadena) interior coastal mountains below 4500 ft.	Partially deciduous tree, spreading, rounded tree to 60 ft. Leaves oblong, 1-2½ in., rounded, leathery, blue-green, smooth to wavy edges. Acorns oblong, ½-1 in. long, cup scaly.

ACTIVITY 1: Learning to Identify California Native Oaks

Species	Habitat	Distribution	Identifying Characteristics
Valley Oak California White Oak Roble *Quercus lobata* 	Oak woodlands and riparian forests of coastal hillsides and Central Valley floor; deep soils	Central Valley, coast ranges and western slopes of Sierra Nevada from Los Angeles Co. to Northern Sacramento Valley, to 5000 ft.	Large deciduous tree, branches heavy dividing near the ground and spreading, droop at ends, to 100 ft. tall. Bark broken into square plates. Leaves, 2-4 in. long, deeply lobed. Acorns conical, 1-2½ in. long with rounded, warty cups. Largest acorn.
Oregon White Oak, Garry Oak *Quercus garryana* 	Southern California coast ranges	Santa Cruz Co. to Vancouver Islands. Coastal to 4000 ft. Scattered in Sierra Nevada.	Large deciduous tree, 50-90 ft. with upward limbs and compact crown. Leaves 3½-6½ in., leathery. Acorns, 1-1/2 in. long, plump cups shallow and warty.
Blue Oak *Quercus douglasii* 	Dry, rocky foothill woodlands and borders of interior valleys	Northern Los Angeles Co. to end of Sacramento Valley, foothills of coast ranges and Sierra Nevada below 400 ft. Found only in California.	Deciduous tree, dense rounded crown, 60 ft. tall; leaves oblong 1½-4 in. long, rounded at ends, often bristle topped with or without shallow lobes, distinctive pale blue-green. Acorns 3/4-1½ in. long, cups shallow and warty.
Canyon Live Oak, Golden Cup Oak *Quercus chrysolepis* 	Canyons, moist to dry slopes	Northern Baja California to Oregon in coast ranges and Sierra Nevada, 1000-6000 ft.	Evergreen tree with short trunk, to 40 ft. tall. Leaves 1-2½ in., long leathery, pointed, spiny, shiny green on top, white or golden on lower surfaces with yellow mid-vein. Acorn egg shaped, 1-2 in., cup warty with velvety golden hairs.

Name: _____

Activity 1: Learning to Identify California Oak Trees

1. Make a list of words that describe how your leaves:

   Feel Smell

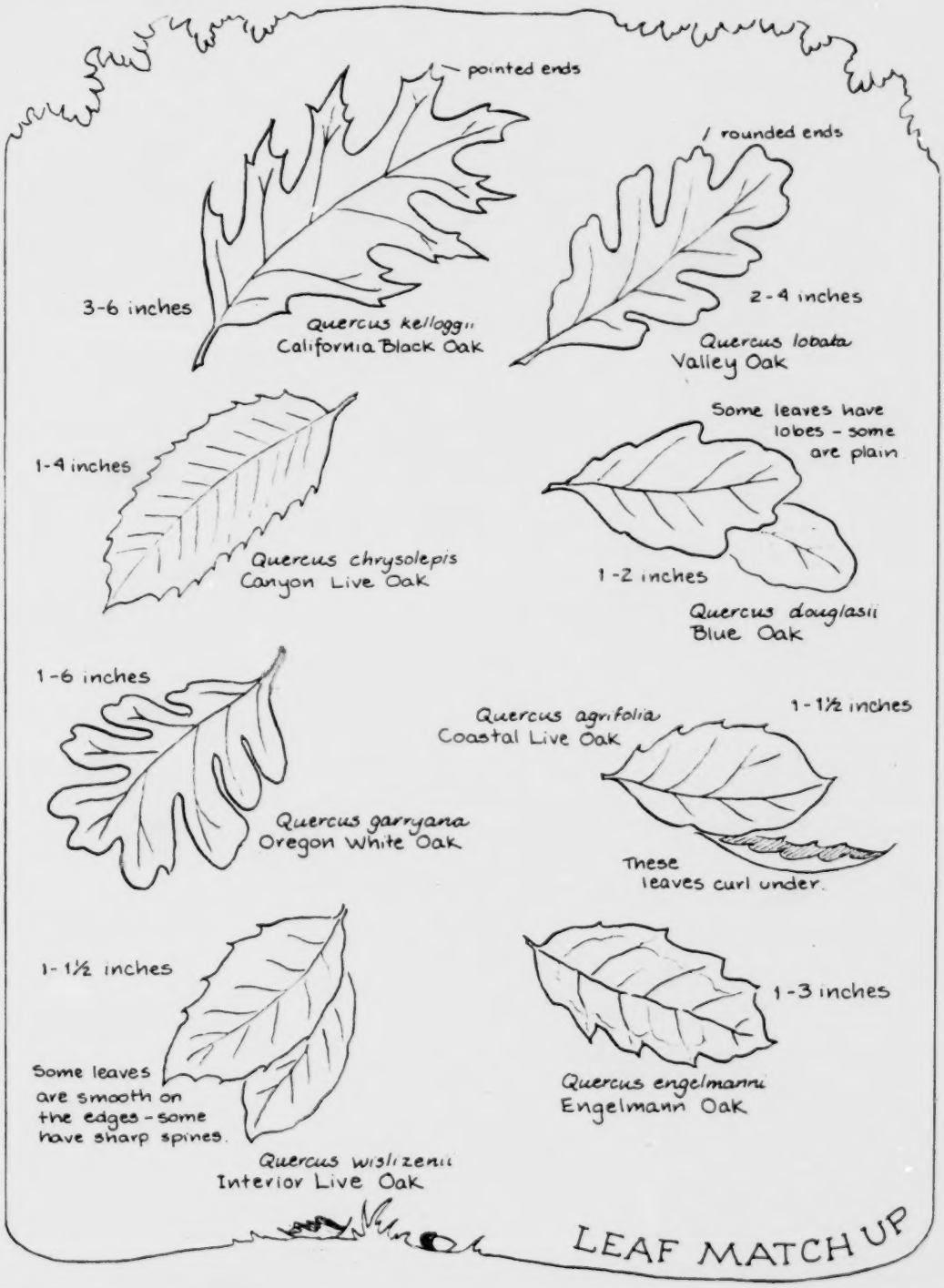
2. Trace or make a rubbing of your oak leaf or leaves.

3. What kind of oak are you observing?

Put this activity sheet in your "OakBook."

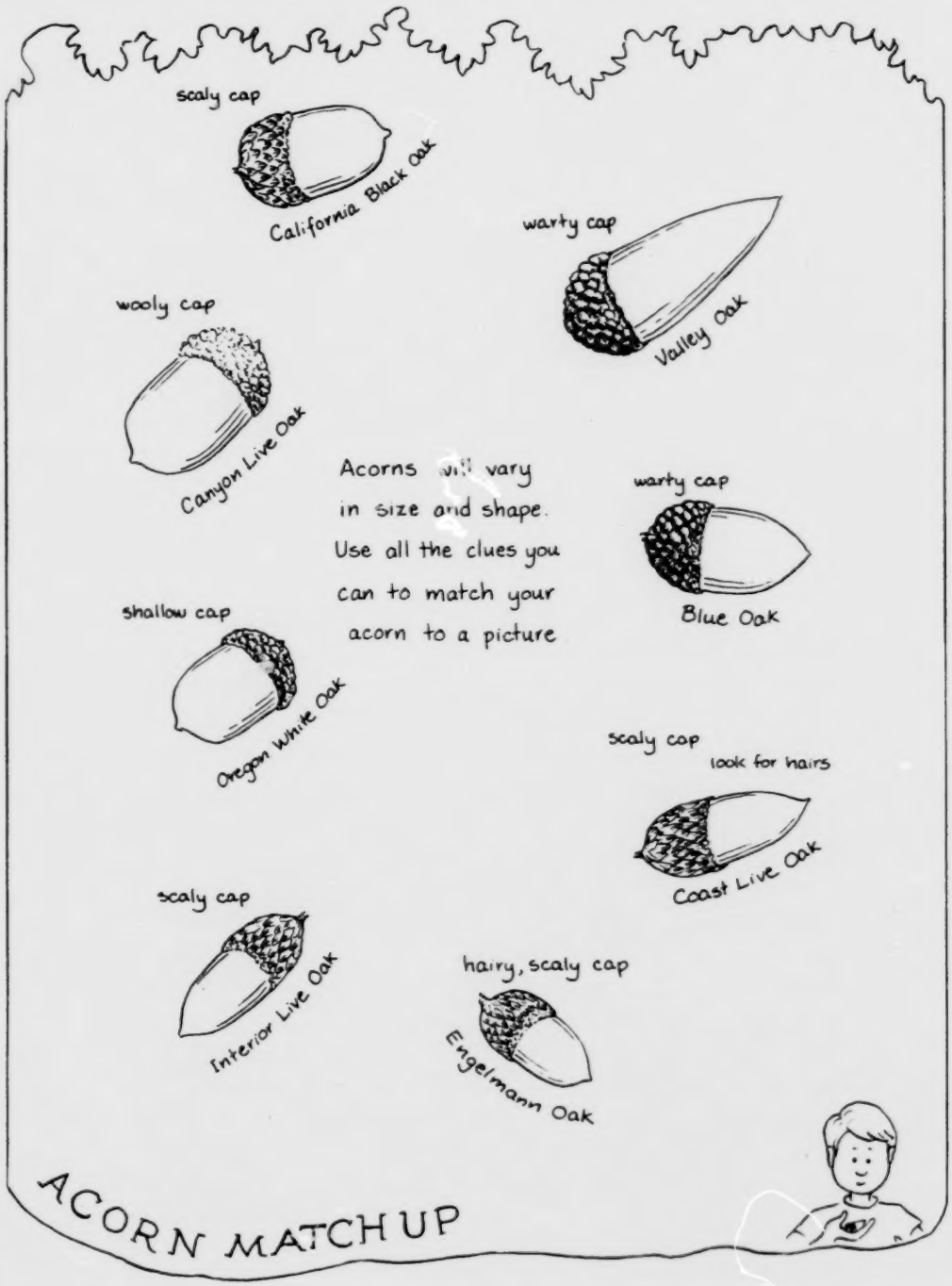
Name: _____

Activity 1: Match Up Leaves



Name: _____

Activity 1: Match Up Acorns



ACTIVITY 2: Collecting and Storing Acorns

OBJECTIVE:

Children learn how to gather and store healthy acorns for growing oak seedlings.

METHOD:

After a demonstration activity, children select healthy acorns and use special techniques for storing them.

CURRICULUM CONNECTIONS:

science, language arts

BACKGROUND:

Acorns mature and drop during late summer and early fall, from August to November. Watch for wildlife gathering acorns as a clue to seed maturity.

Collecting Acorns

Not all acorns will be healthy. Some may not be completely formed or may have insect damage. Choose acorns that are greenish brown, firm and plump. Acorns with pinholes may indicate insect activity inside.

Pick the acorns directly from the trees or gather them from beneath the tree's canopy. Try to collect acorns from trees growing close to where you intend to plant the new trees. This will ensure that the oak stand will have new members that are genetically related to each other and are adapted to the environmental conditions of that site.

Use a long, slender stick or branch to "beat" ripe acorns from high above. Place a tarp below the tree's canopy to catch acorns as they fall. This is an easy method to gather acorns and does not harm either the tree or the acorns.

Tips on Gathering Acorns

Where can you gather acorns and what should you do to obtain permission to gather these seeds?

Select a park, roadside, national or state forest or other public area with oaks. Check with park managers about regulations or restrictions that may prohibit collecting acorns. If you collect on private property, be sure to obtain owner's permission before entering to collect seeds. *California has explicit laws about gathering plant materials and it is important to remember that these regulations are designed to protect both plants and wildlife species.* Take only a portion of what you find. Leave enough for the wildlife to use. In many cases, jays, woodpeckers and squirrels are also busy gathering acorns. Some of these seeds become new oaks, too.

ACTIVITY 2: Collecting and Storing Acorns

Processing Acorns for Storage

Follow these steps:

- Remove acorn caps and separate different species into separate storage containers.
- Label each container with the date, collection location and type of oak.

Acorns may be stored for several weeks as long as there are adequate moisture and cool temperatures. Keep them damp, preferably in a closed container or self-sealing plastic bag. Rinse the seeds often to remove mildew on the seed surfaces and to add fresh moisture.

Store only healthy acorns. Check for good acorns by using the "sink-float" test, described in the following activity.

After processing the acorns, plant them in growing containers or in their natural habitat. You may choose to delay planting and keep the seeds in cold storage for several months (October to January).

Other considerations:

Once you have identified a location for gathering acorns, plan a field trip to collect enough seeds to carry out this project. Try to coordinate the collecting activities with a visit to a park or nature area. Providing students with a first-hand experience to view oaks, gather and test acorns, collect data and conduct other investigations will help build their knowledge, understanding and appreciation of oaks. Also, try using additional science and environmental education activities (see "Follow-Up" activities).

If you are unable to locate a source of acorns or have begun this activity too late in the year to collect seeds yourself, refer to Appendix 3 to locate an organization that may have a supply of acorns it can share with you.

If acorns are collected directly from the tree branches, place them in plastic bags and put them in a refrigerator or cool place. If collected from the ground, first soak them in water for 12-24 hours (see activity procedure for additional information).

ACTIVITY 2: Collecting and Storing Acorns

ACTIVITY PROCEDURE:

Acorn "Sink & Float"

grades: K-6
time: 60 minutes
materials:

- ✓ *acorns*
- ✓ *containers to store acorns*
- ✓ *containers for "sink & float" activity*
- ✓ *copies of activity sheet*

skills:

observe
communicate
compare
analyze
infer

Take caps off the acorns, place them in a container and cover them with water. Immediately remove any acorns that float (Note: keep all "floater" corns for the investigation activity).

Allow the seeds to soak for at least 12 hours. Remove seeds that have floated to the top of the container.

Drain off the water and "sinker" acorns and place these in storage containers as described in the "background" section.

Using the "floater" acorns, ask students to propose ideas or hypotheses about what may have caused these seeds to float. Allow students break open the seed to investigate its contents. Ask them to record their observations on the activity sheet.

FOLLOW-UP ACTIVITIES:

- Find out how animals gather acorns. Which birds and mammals collect acorns? Where do they store them? Make first-hand observations.
- Find out how native Californians gathered and stored acorns.
- Write a story about gathering acorns. Incorporate "cues from nature" to indicate when acorns are ripe. (Note: in many parts of the world, farmers still plant and gather their crops according to their close observation of the natural world.) Make puppets and other props and share the story with others.
- Use a ripe acorn to learn about the parts of a seed. You'll find out how much work it is to remove the acorn's seed coat. Recall that native Californians had to remove acorn seed coats in the labor-intensive process of preparing acorn mush.

ACTIVITY 2: Collecting and Storing Acorns

- Check your local library for a videotape produced by Clyde B. Smith under the supervision of Professor Samuel A. Barrett, University of California, Berkeley, entitled "Acorns: Staple Food of the California Indians." The 28-minute production features Pomo tribe members demonstrating traditional acorn harvesting, storing and ıeaching techniques.

- Try *Project Learning Tree* activities: "Signs of Fall," "School Yard Safari."

- Try *Project Wild* activities: "Microtrek Scavenger Hunt," "Urban Nature Search" and "Seed Need."

- Try activities from *OBIS*: "Acorns," and *NatureScope: Trees are Terrific.*

EVALUATION:

After collecting or observing acorns, each child successfully completes the activity sheet and includes it in his or her "OakBook."

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Bush, L. and R. Thompson. *Acorn to Oak: A Guide to Planting and Establishing Native Oaks.* Circuit Rider Publishers, Inc., Windsor, CA. 1989.

California Oak Foundation. *How to Collect, Store and Plant Acorns.* Publication #1. Sacramento, CA.

B. Pavlik, S. Johnson, and P. Muick. *Oaks of California.* California Oak Foundation. Cachuma Press, Los Olivos, CA. 1991

Name: _____

Activity 2: Collecting and Storing Acorns

1. Draw or describe what happened when you soaked the acorns.

2. Draw or describe what you found inside the acorns that floated.

3. What new ideas or information did you learn from this investigation?

Put this in your "OakBook."

ACTIVITY 3: What Do Young Oak Trees Need to Grow?

OBJECTIVE: Children investigate several physical properties of soil in order to understand why soil is important in growing trees.

METHOD: Children conduct several soil investigations and prepare soil to plant acorns.

CURRICULUM CONNECTIONS: science, mathematics, language arts

BACKGROUND: Studying soil in the context of growing trees can help children understand how different soil types affect plant growth.

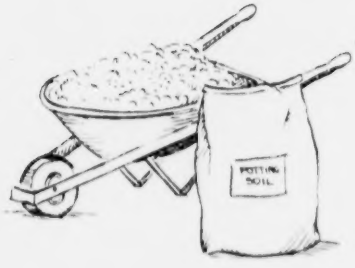
Soil is a collection of mineral particles mixed with living and non-living organic matter, water and air. The different soil types are determined by their parent material and the size and shape of mineral particles.

- *Clay* soils (sometimes called adobe or heavy soil) are made up of microscopically small mineral particles. These tiny flattened particles (1/12,500th of an inch) limit space for air and water. Clay soils drain slowly because water has difficulty moving through the particles.

- *Sandy* soils are made up of large, round particles (1/8th inch) that create large spaces between particles. These soils drain well, warm quickly and contain much soil air. They do not hold water well and tend to lose valuable soil nutrients with frequent watering.

- *Loam* soils are a combination of sand, clay and silt (particle size-1/500th inch). This is the ideal soil type for growing plants. Loamy soils drain well, do not dry out quickly and have a lot of soil air that promotes good root growth.

- *Humus*, also known as mulch or compost, is organic matter such as old leaves, bark and insect parts. This material provides a nourishing layer of topsoil.



ACTIVITY 3: What Do Young Oak Trees Need to Grow?

You will need fertile soil to successfully grow acorns into oak seedlings. Healthy acorns will germinate in native soil, soil from where the trees grow naturally, but some consideration should be given to soil composition to ensure good seedling growth. If you plan to grow acorns in containers, follow these guidelines.

- Purchase potting soil from a local garden center or use garden soil that has been sterilized in an oven for two hours at 160-180°F. Soil contaminated with microbes, weed seeds and snail eggs will interfere with acorn germination.

- Try making soil. An easy recipe for soil calls for mixing two parts loam with one part sand. To make it spongy and light, add vermiculite, perlite, crushed rock or broken bricks to the mixture.

ACTIVITY PROCEDURE:

Hold a group discussion to emphasize the importance of soil in growing healthy oak seedlings. Describe the different types of soils. Highlight words in the vocabulary list featured in the "word search" activity.

Ask children to visit several places where different soils can be sampled. Use the school yard or a park to collect soil samples. Suggest taking samples from near a slide, "homebase," doorways or an open field. Let them decide where to collect the sample.

Use the soil samples to complete several investigations:

Soil Study

grades: 2-6
time: 30-60 minutes
materials:
- *spoons*
- *paper bags*
- *soil samples*
- *hand lenses*
- *paper plates*
- *activity sheets*

skills:
- *observation*
- *communication*
- *comparison*
- *organization*
- *analyze*

Ask children to transfer their sample to a sheet of white paper (or paper plate) and use toothpicks to group parts of the soil sample into different piles. Use hand lenses or other magnifiers to observe carefully.

After they have had time to separate the soil sample into its different parts, ask them to draw a circle around the groups and decide which parts were in greater amounts.

For older children, use the "Soil Sample Sort" activity sheet to complete the same activity. Graph paper can be used to help quantify the different amounts of each soil component.

Using this investigation, ask children to determine what category of soil they have collected (sand, silt, clay, loam, humus, etc.) and decide if this soil would be suitable to grow acorns into healthy oak seedlings.

ACTIVITY 3: What Do Young Oak Trees Need to Grow?

Soil shakes

grades: K-6
time: 10 minutes, then let sit overnight
materials:
- *soil sample*
- *jar*
- *water*

skills:
- *observe*
- *communication*
- *compare*
- *organize*
- *analyze*

Use this activity as a demonstration or small group task.

Place a soil sample into a jar. Fill the jar with water. Close the lid and shake hard. Let the jar stand overnight. Use one part soil, four parts water.

The following day, children will be able to observe that the soil sample separated into layers. Larger particles (coarse sand and rocks) settle on the bottom and the finer particles of silt and organic materials (leaves, twigs, stems) will float or be suspended in the water.

Ask them to form hypotheses prior to conducting the activity and follow-up with describing their observations.

Making Potting Soil

grades: K-6
time: 30 minutes
materials:
- *loam*
- *sand*
- *crushed rock*
- *vermiculite*
- *plastic bag*

skills:
- *observe*
- *communicate*
- *compare*

To make your own potting soil, follow the recipe described in the "background" section. Allow children to mix the soil with their hands. Store the soil in a wheelbarrow or a large plastic bag until you are ready to plant the acorns. Repeat the "soil sample" investigation and "soil shake" activities with this soil and make comparisons.

Use the "word search activity" to reinforce understanding of soil terms.

ACTIVITY 3: What Do Young Oak Trees Need to Grow?

FOLLOW-UP ACTIVITIES:

- Make compost. After partially decomposed, give children a scoop of it on a paper plate and examine with hands lens.
- Explore how long it takes water to seep into different soil types. Dig a hole in the ground and fit in a can or paper cup with holes punched in the bottom. Fill the can with water and find out how long it takes the water to soak into the soil. Try this in different soil types.
- Moisten a soil sample and see how it feels. Sand feels gritty, silt slippery and clay sticky.
- Visit with a soil scientist. Call your local Soil Conservation Service or Cooperative Extension offices for information and contacts. (Check Appendix 3 for suggestions.)
- Test for soil compaction. How easy is it to stick a pencil into the soil? Discuss what causes soil compaction. Compare different areas of the playground. Make a list and provide an evaluation.
- Learn the song "Dirt Made My Lunch." Write for a catalog of tapes that include this song: Banana Slug String Band, P.O. Box 717, Pescadero, CA 94060.
- Try *Project Learning Tree* activities:"Holding Water," "What's in Soil," "Succession and Soil Compaction," and "Sand, Silt and Clay."
- Try *Project Wild* activities: "The Beautiful Basics" and "Eco-Enrichers."
- Try *OBIS* activities: "Natural Recycling in Soil" and "Super Soil."

EVALUATION:

Have children follow up the soil study by completing the "word search" and answering the activity questions. Responses will vary based on their observations. Include these sheets in their "OakBook."

REFERENCES:

New Western Garden Book. Sunset. Menlo Park, CA. 1979.

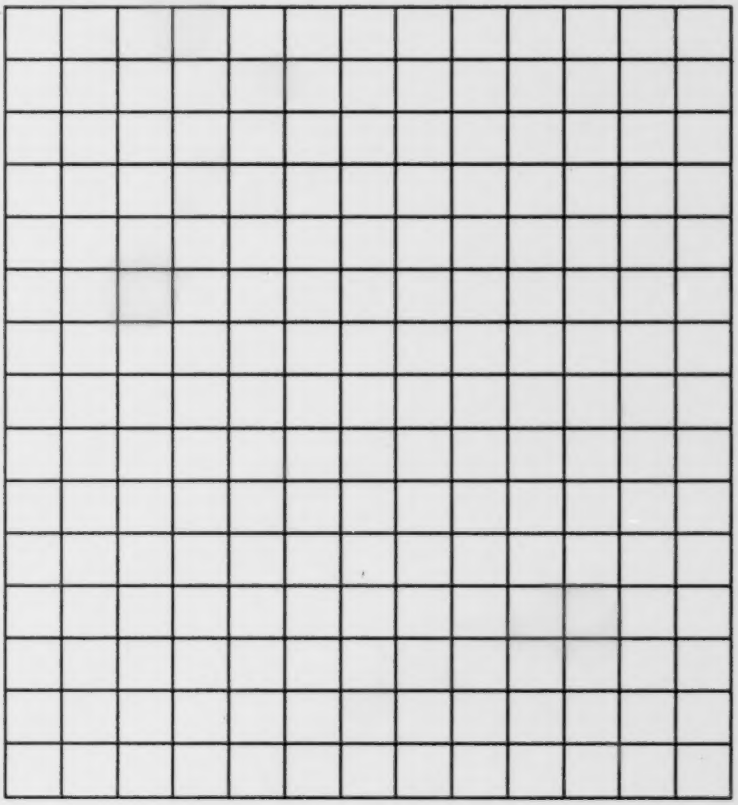
University of California Agricultural Sciences Publications *What on Earth is Soil?* (#2637) *Compost Preparation* (#2559), and *Soil: Physical Environment and How it Affects Plant Growth. (#2280)*

Wyler, Rose. *Science Fun with Mud and Dirt*. Simon and Schuster, NY. 1986.

Name: _____

Activity 3: Soil Sample Sort

You need: a spoon, magnifier, pencil, toothpick and this paper. Take one teaspoon of a soil sample and place it on this paper. Using a toothpick, separate the sample into different parts. Put each kind of soil part into its own square(s).



Follow-up

1. How many different parts did you find in your soil sample? Which part filled up the most squares?

2. What new information did you find out?

Put this activity sheet in your "OakBook."

Name: _____

Activity 3: Soil Study Observation and Data Sheet

1. Where did you collect your soil sample?

2. Describe how your sample
   looks smells feels

3. Draw what you see when you look at your soil sample under a magnifying glass.

4. What happened to the "soil shake?"

5. How long did it take to settle?

6. Draw a picture to show how the soil sample looks now in the jar.

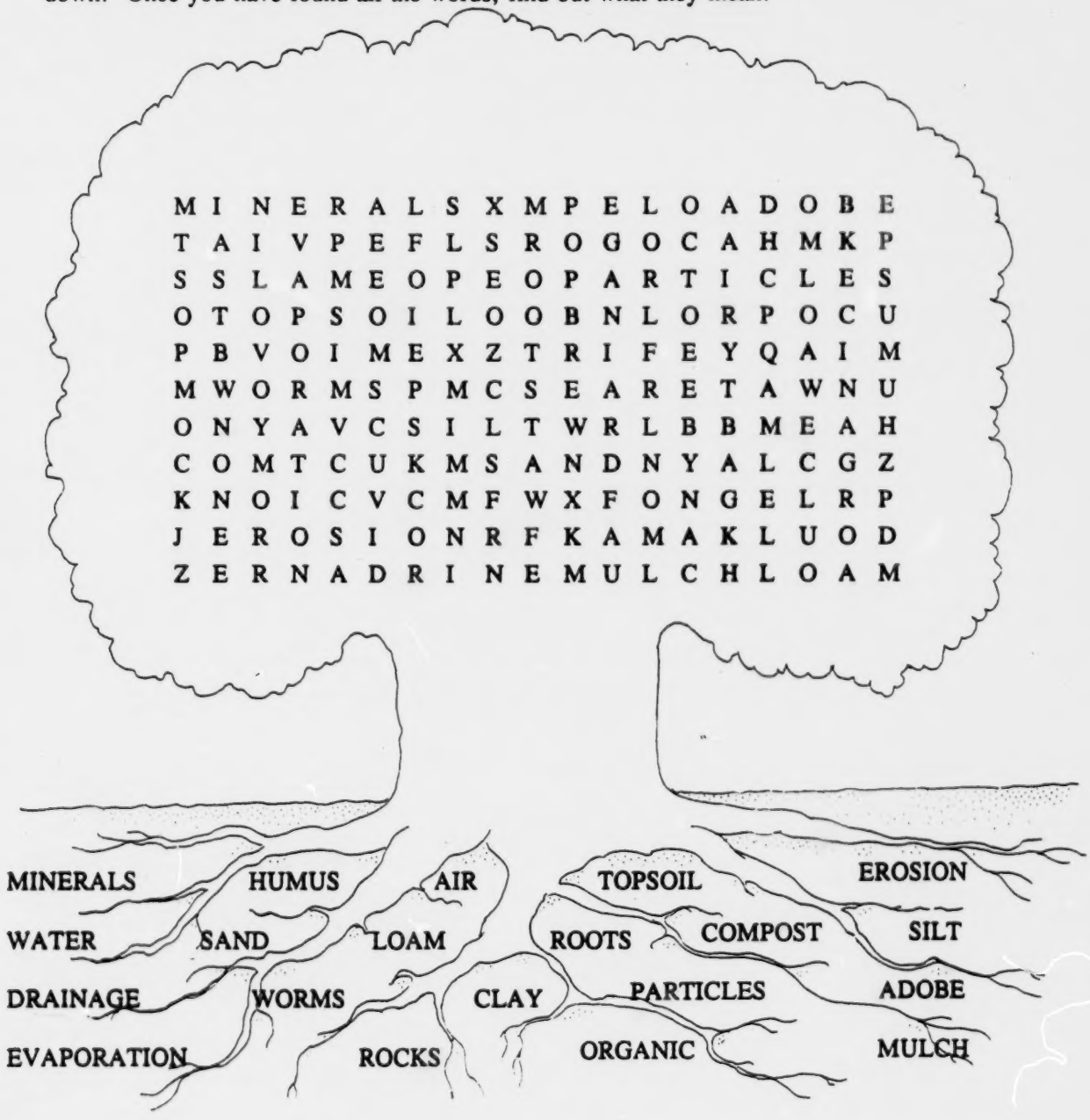
7. Would your soil sample be a good soil in which to plant your acorn? Why?

Put this activity in your "OakBook."

Name: _____

Activity 3: Soil Word Search

Below the oak tree are 20 soil words. Some words may read forward, backward, up or down. Once you have found all the words, find out what they mean.


M I N E R A L S X M P E L O A D O B E
T A I V P E F L S R O G O C A H M K P
S S L A M E O P E O P A R T I C L E S
O T O P S O I L O O B N L O R P O C U
P B V O I M E X Z T R I F E Y Q A I M
M W O R M S P M C S E A R E T A W N U
O N Y A V C S I L T W R L B B M E A H
C O M T C U K M S A N D N Y A L C G Z
K N O I C V C M F W X F O N G E L R P
J E R O S I O N R F K A M A K L U O D
Z E R N A D R I N E M U L C H L O A M
MINERALS
HUMUS
AIR
TOPSOIL
EROSION
WATER
SAND
LOAM
ROOTS
COMPOST
SILT
DRAINAGE
WORMS
CLAY
PARTICLES
ADOBE
EVAPORATION
ROCKS
ORGANIC
MULCH

ACTIVITY 4: Planting Acorns

OBJECTIVE: Children learn how to plant acorns.

METHOD: Children learn how to select and plant a healthy acorn according to the directions given.

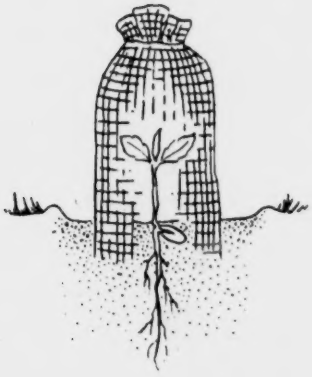
CURRICULUM CONNECTIONS: science, language arts, art

BACKGROUND:

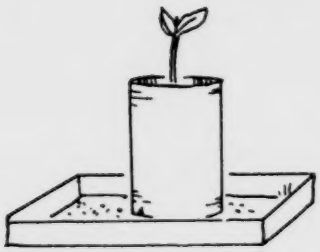
From late October to January, the tip end of healthy acorns will begin to split and the taproot will begin to emerge. During this period, they can be planted in containers or directly in the ground. It is important to plant them before the taproot is too long. Plant the acorns on their sides with the upper end near the surface of the soil or pointing straight down if you are using a narrow container. Do as the jays do -- push the acorn into the soil to hide it. If the root tip is showing, take care not to break it. A healthy acorn will grow regardless of what direction it is planted, but one that is upside down will take longer to sprout.

Any type of container will do as long as the root system has adequate growing space. Use large containers such as coffee cans, #10 size cans or milk cartons. Drainage holes must be made along the sides or bottom of cans. If you use recycled nursery containers or milk cartons, be sure they are clean and free of molds.

If acorns are to be planted directly into the ground it is advisable to mark the site with a stick. Plant several acorns then choose the most vigorous one after they sprout. Oak researchers advise using a screen enclosure around acorns planted in the ground. This protects acorns and seedlings from hungry animals, provides shade and helps to concentrate dew, fog and rain. Study the illustration provided if you need to create a barrier for your seedlings. Be sure to plant extra acorns in containers to ensure each child has a seedling. It is recommended that you plant at least an additional 20% as backup.



ACTIVITY 4: Planting Acorns



Review the background information provided in Activity 3 and 5. In order to successfully grow acorns into seedlings, you will need to

- Provide seedlings with adequate sunlight or artificial light.
- Check to see if air currents are a problem. Too much circulating air will dry out the soil.
- Use a shallow tray or pan to catch water draining through the soil. Never allow the seedlings to sit in the excess water. Too much moisture will cause the roots to rot.
- Check air temperature; a range between 65-75°F is ideal.
- Care for young oak seedlings on a regular schedule. Water seedlings *only when the soil is dry*. Poke your finger into the soil to check the soil moisture.
- Keep seedlings out of direct sunlight and away from hungry animals.

ACTIVITY PROCEDURE:

grade: K-6
time: 30-60 minutes
materials:
- *soil-2 cubic ft. bag/group of 30 children*
- *containers*
- *labels*
- *acorns*
- *activity sheets*
- *certificates*

skills:
- *observation*
- *comparing*
- *communication*

Have children make observations of the acorns (color, length of sprout, size) and note information on the activity sheet. Demonstrate how to plant an acorn. Allow enough time for each child to fill a container with potting soil. *Allow each child to plant an acorn.*

Follow up this activity by asking the children to complete the activity sheet and fill out the certificate.

FOLLOW-UP ACTIVITIES:

- Ask the children to demonstrate acorn planting procedures to others (peer teaching).
- Read the Johnny Appleseed story. See references listed below.
- Keep a visual record (slides or video) of the acorn-planting activity.
- Plant some acorns in containers and others in the ground outside. Make comparisons of their growth rates.
- Poke toothpicks in a peeled acorn (as done for avocados), hang over a jar of water to watch how the root develops.
- Try *Project Learning Tree* activity: "A Tree from an Acorn Grows."
- Try *OBIS* "Acorns" activities.

EVALUATION:

After successfully planting an acorn, each child will complete the activity sheet, fill out a certificate and include these in their "OakBook."

REFERENCES:

Aliki. *The Story of Johnny Appleseed*. Prentice-Hall Books for Young Readers. NY. 1963.

California Oak Foundation. *How to Collect, Store and Plant Acorns* (Publication No. 1), *Planting Oaks from Acorns* (Publication No. 2). Sacramento, CA.

Kellogg, Steven. *Johnny Appleseed*. Marrow Junior Books. NY. 1988.

Name: _____

Activity 4: Acorn Planting Information

1. What does your acorn look like? Describe it in words or draw a picture.

2. Draw a picture or list the steps you used to plant your acorn.

Keep in your "OakBook."

Official Adoption Certificate

"I, _____, promise to care for my California native oak. I promise to give it water and sunlight, and to watch over it during hot and cold weather. When it is 1 year old, I promise to plant it in a place where it will have plenty of space and sunshine. I will water it during the warm weather for the first three growing seasons, until it is established. I will always remember how special my California native oak is to my community."

Signature of Witness _____

Date _____

ACTIVITY 5: Nurturing New Oak Trees

OBJECTIVE:

Children are able to describe the proper care of a seedling oak tree.

METHOD:

Through group discussions and individual observations, children learn how to care for their oak seedlings.

CURRICULUM CONNECTIONS:

science, mathematics, language arts, fine arts

BACKGROUND:

Caring for oak seedlings requires understanding of how young trees grow. Review information provided in Activity 3 and consider these additional points.

Light:

All plants need light in order to carry out photosynthesis, the complex process enabling plants to convert light energy, carbon dioxide and water into oxygen and carbohydrates. All life on Earth depends upon this biochemical process. Refer to the illustrations provided in this activity.

If oak seedlings are grown indoors, place them near a window or skylight. Short periods of direct sunlight can be beneficial, but avoid extreme temperatures caused by direct exposure to sunlight.

Artificial light can be used if natural light is not available. One 100-watt incandescent or two fluorescent bulbs placed over (about 1-2 feet above) the seedlings will be enough. Incandescent light is rich in "red" light waves that help seeds to germinate, but also causes seedlings to grow spindly stems. Heat from lights can dry out the soil. If artificial lights are used, limit the light period to 12 hours.

Temperature:

Seedlings grow well in room temperatures ranging between 65-75°F. Night temperatures should not drop below 60°F.

Water:

Use caution when watering seedlings. The soil should never be soggy. Allow excess water to drain out of the container or soil fungi and bacteria will spread and damage or kill the seedling. Take care to avoid washing soil away from the young, tender roots.

Water Moisture:

Air-conditioned rooms lack moisture unless a humidifier is used. Seedlings will benefit from occasional misting. Never place seedlings in a location where they receive a constant flow of air from the furnace air ducts or their leaves will dehydrate.

ACTIVITY 5: Nurturing New Oak Trees

Follow these guidelines in caring for seedling oaks:

- ✓ Saturate the containerized seedlings with water,
- ✓ Wait until the soil almost dries out before watering again.
- ✓ Do not allow the seedlings to sit in the excess water.
- ✓ Keep seedlings in a cool, shady place. Avoid excessive and varying soil temperatures.

ACTIVITY PROCEDURE:

Grades: K-6
time: 30-40 minutes
materials:
thermometer
watering cans
skills:
communication
comparing
inferring

1. Use these questions to introduce children to information about the physical requirements necessary to grow oak seedlings:
   - What does an acorn need to grow?
   - How can you tell if it needs water?
   - How much water should you give your seedling?
   - How will you know if you have given it too much water?
   - How can you tell what the soil temperature is?
   - What can happen if the soil around the acorn becomes too hot?

Grades: K-6
time: 15 minutes/week
materials:
copies of "Seedling Growth Sheet"
paper strips, ¼"x11"
skills:
observing
communication
comparing
organizing
inferring

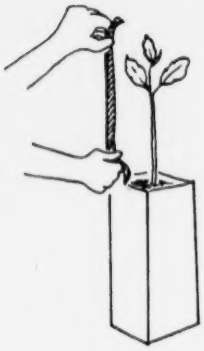
2. Once seedlings begin to grow, children can begin to graph the rate of stem growth. Using a thin strip of construction paper to measure stem length, snip off the strip at the point where the stem ends. (Some seedlings grow so quickly that strips longer than 11" will be needed!) Attach the measuring strip to the horizontal axis (the time line) of the "Seed Growth Sheet." Seedling height can be read using the vertical axis.

Grades: K-6
time: ½ hour
materials:
clay

3. Make a "water watcher." Give each child a handful of clay. Ask them to shape the clay into a length that can be stuck into the growing container. Form a hook on one end to hang over the outside edge of the container. Suggest adding a feature such as an animal face who will "watch out" for the young tree.

   After the "water watcher" dries, stick it in the container. Note that whenever the "water watcher" is dry, so is the soil. Likewise, a damp "water watcher" indicates moist soil.

FOLLOW-UP ACTIVITIES:



- Collect rainwater for watering acorns. Find out why rainwater may be better to use than tap water.
- Keep a rainfall record. How does the amount of rainfall compare to the amount of hand watering needed.
- Discuss how a tree grows. Find out how water travels through a seedling.
- Measure and keep accurate records of how much water is given to seedlings.
- Keep a visual record of seedling growth changes. Make drawings or take photographs.
- Try *Project Learning Tree* activities: "Graph Growth," "Fertilizers," "Nature's Air Conditioner."
- Try *Project Wild* activity "Graphananimal."
- Try *NatureScope: Trees are Terrific* activity: "Tell-Tale Transpiration."

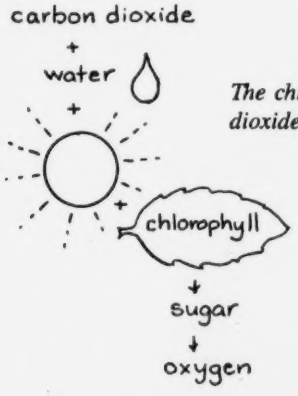
EVALUATION:

Children successfully make at least two seedling measurements and construct a graph to record growth rates. The graphs are kept in their "OakBook."

REFERENCES:

Burnie, David. *Tree*. Eyewitness Books. Alfred A. Knopf. New York. 1988.

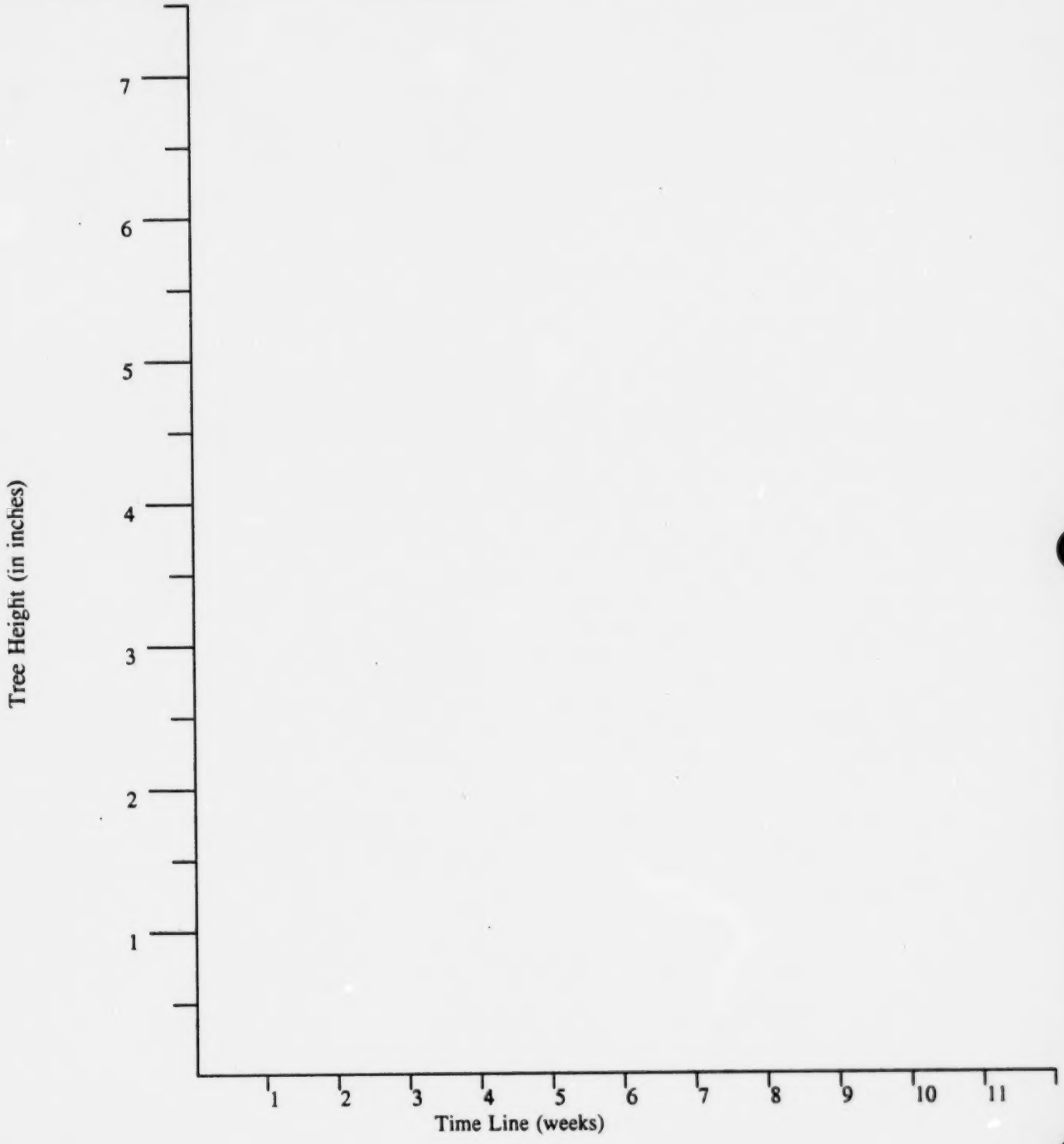
New Western Garden Book. Sunset. Lane Publishing Co., Menlo Park, CA. 1979.



The chlorophyll in each leaf turns the sun's energy, carbon dioxide, and water into food and puts oxygen into the air.

Name: _____

Activity 5: Seedling Growth Sheet



ACTIVITY 6: Oaks and Wildlife

OBJECTIVE: Children identify the common wildlife that depend upon oaks or live in oak woodlands.

METHOD: Children participate in a variety of activities that reinforce their knowledge of oak woodland wildlife.

CURRICULUM CONNECTIONS: science, art

BACKGROUND: No matter how important oaks are to people, many kinds of California wildlife depend upon these trees for their existence. Learning about how wildlife depend on oaks can help children understand the importance of protecting and caring for these magnificent trees.

Many creatures make meals of acorns and oak leaves. About two dozen species of birds eat acorns. Scrub jays, magpies, wood ducks, wild turkeys, mountain quail, flickers, and acorn woodpeckers depend on oaks for food.

Animals play a significant role in acorn dispersal. Squirrels and scrub jays hide acorns for later consumption and many of these seeds grow into new trees. Well-hidden seeds are protected from freezing and drying. Left above ground, they dry out and fail to grow.

Insects, in great numbers, also feed on leaves, twigs, acorns, bark, and wood of oak trees. Many of these six-legged creatures become meals themselves. Bushtits, warblers, vireos, and orioles are among the many insectivorous birds that feed in oaks.

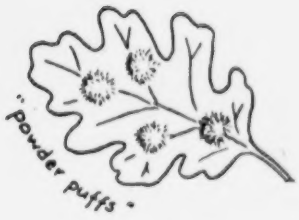
One of the most colorful associates of oaks is the acorn woodpecker. These birds drill holes in the bark of oaks and other trees (and sometimes wooden poles and buildings) where they store acorns. Trees with more than 200 acorns have been found! Some woodpeckers also feed on oak sap.

Barn owls and wood ducks and many other cavity-nesting birds use oaks as their homes. In winter, ring-tail cats and squirrels sleep in oak tree cavities; in summer, squirrels make nests in oaks. Bees build beehives in hollowed-out oak trunks.

You can find galls throughout many seasons, especially summer and fall. These interesting formations are developed when the insect eggs (usually from a wasp) are deposited on oak leaves or branches. Oak tissue serves as an "insect nursery" by growing around the eggs. These coverings protect larval and adult forms.

ACTIVITY 6: Oaks and Wildlife

Scientists say that galls do not harm the oaks in any way. Look for "oak apples," "candy kisses," "jumping balls," and "powder puff" galls on oaks. Oak gall iron ink, used by early California settlers, can be made from oak galls. Look for a recipe in "follow-up activities."



Other creatures, such as spiders, centipedes, and pseudo-scorpions, can be found on oak bark or hiding beneath it. Nematodes (tiny round worms) and earthworms by the hundreds live within the root system. Look in the leaf mulch at the tree's base to find slugs, snails, wood lice, beetles, millipedes, centipedes, caterpillars, earwigs, ants, spiders, and daddy long-legs.

Oaks continue to be useful to wildlife even after they die. Salamanders, worms, snails, termites and ants live in decomposing logs and help turn wood into humus, which enriches soil.

An oak tree is truly a "community" of living organisms. Scores of species and thousands of individual organisms use a single oak as an "island of life." The loss of oaks will have a big impact on the survival of many types of wildlife.

ACTIVITY PROCEDURE:

Hold a group discussion to describe how California's wildlife is dependent upon oaks. Highlight a variety of species -- acorn eaters, insects, galls, and "decomposers." Allowing children to observe these organisms first-hand can be a very meaningful way for them to learn about oaks and wildlife.

grades: K-6
time: 60-90 minutes
materials:
copies of "Peek and Seek" activity
scissors
crayons, etc.
skills:
observation
comparison

Set up a "touch table" for children to explore galls, holes in dead branches, wormy acorns and other oak items. Cut an "oak apple" gall in half to see its styrofoam-like contents. If live wildlife is observed, take care to keep it only temporarily, and replace it where it was found. Reinforce the value of not harming or taking wildlife away from its natural surroundings.

- Use the "Peek and Seek" activity to help children learn about oaks and wildlife. This illustration features many species of California wildlife that depend on oaks. Help children find out which species are found in your community.

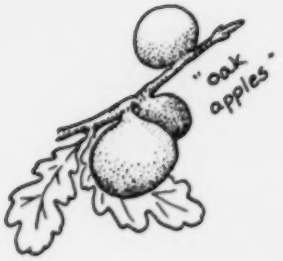
EVALUATION:

Children successfully complete the activity and can describe several kinds of oak-wildlife interrelationships.

ACTIVITY 6: Oaks and Wildlife

FOLLOW-UP ACTIVITIES:

- Read aloud Mark Twain's story, "What Stumped the Blue Jay," a tall tale featuring oaks and jays.
- Read aloud from, "*A View from the Oak.*" This book explores live animals -- spiders to whales. The last chapter takes a closer look at life from within, and on, an oak tree.
- Visit a nature area or park to view oaks and wildlife.
- Dissect an oak gall.
- Make ink from oak galls. Follow this recipe:



Oak Gall Ink

Mix:

1 oz	crushed oak galls
1 cup	water
	bread mold inoculate

Soak crushed galls in enough water to cover. Inoculate with mold and allow to ferment 8-10 days. Then pour boiling water over mass to bring volume up to one cup. The boiling water will stop the fermenting process. Filter off the oak gall and mix the oak gall juice with

1 cup	oak gall juice
1 T	ferrous sulfate
1 tsp	hematoxylin
2 T	gum arabic

Pour in a bottle to save.

The Declaration of Independance was signed with ink made from oak galls.

ACTIVITY 6: Oaks and Wildlife

REFERENCES:

Bakker, Elna. *An Island Called California*. University of California Press. Berkeley, CA. 1985. Describes the natural history of California's oak woodland species.

Kohl, Judith and Herbert. *A View from the Oak*. Sierra Club Books. San Francisco, CA. 1977.

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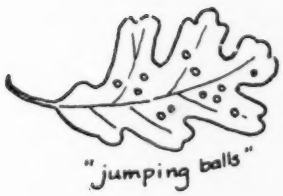
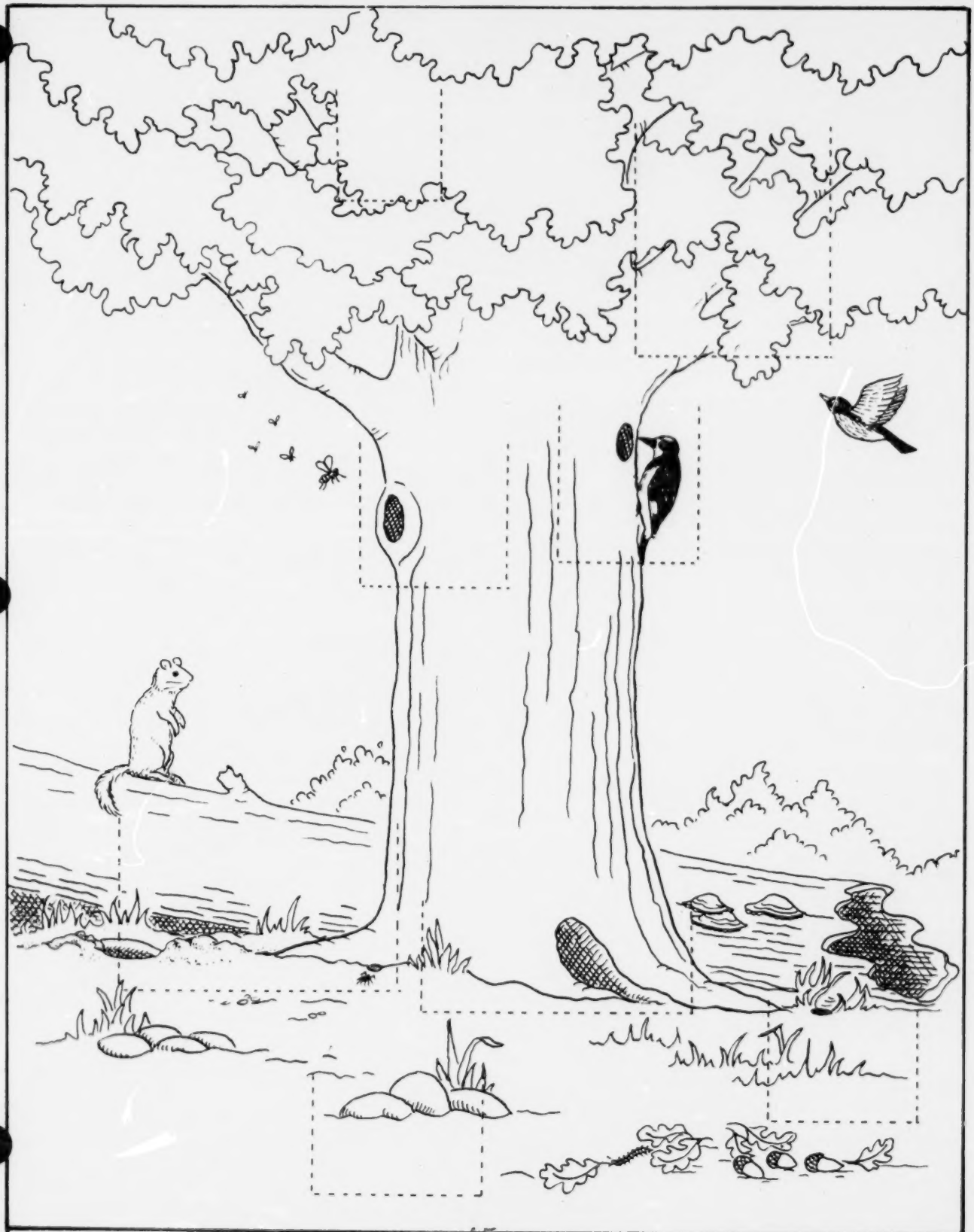
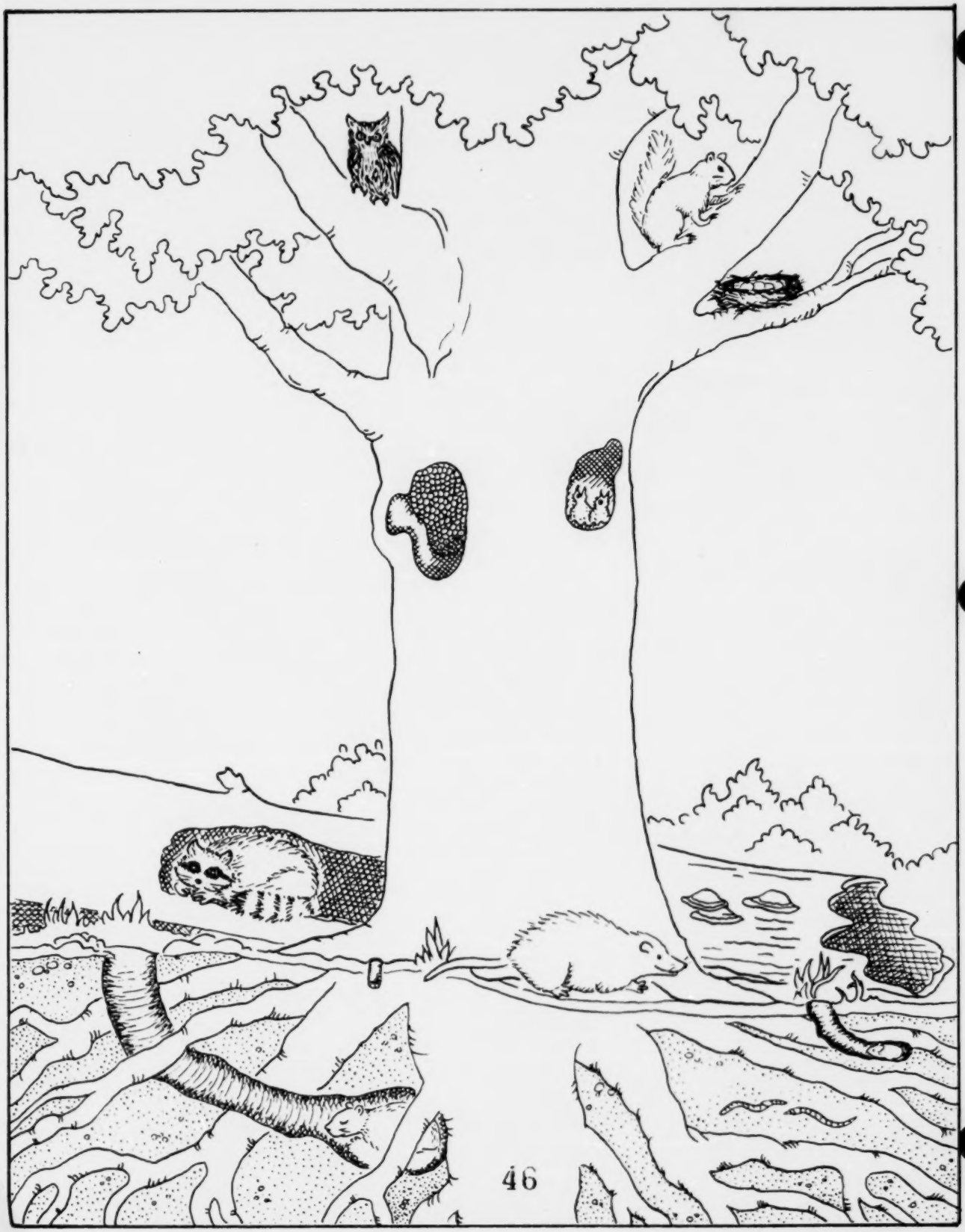


Wherever you find oaks you will find gall wasps and their ornate houses -- sometimes over a dozen different kinds on one tree!

SHEET A · cut on dotted lines · put sheet A on sheet B · PEEK and SEEK





ACTIVITY 7: Evaluating and Appreciating "Heritage Oaks"

OBJECTIVE:

After an investigation activity, children can recognize and evaluate the characteristics of a "Heritage Oak" tree.

METHOD:

Children locate and evaluate an old oak tree and make the necessary assessment to register the oak as a "Heritage Oak."

CURRICULUM CONNECTIONS:

science, mathematics, language arts, history

BACKGROUND:

Throughout California's cultural history, oaks have provided the scenery for many dramatic events. Standing beneath the canopy of an old oak -- going back in time -- we can begin to imagine these changes.

The large, old oaks that still stand in small groves or alone in our neighborhoods are often called "Heritage Oaks" or "landmark" oaks. Indeed, some of them were landmarks, indicating boundaries of land grants or property lines. One such tree can be found in the University of California, Davis, Arboretum.

A "Heritage Oak" is often defined as a living native oak tree, several hundred years old, in good health, with a trunk circumference of about 100-inches measured 4½ feet above the ground. Height is not a determining factor; some very old oaks are quite short. In fact, oak researchers in Northern California have noted 100-year-old blue oaks with 6-inch diameters.

Many communities "register" old oaks. This helps provide an inventory of significant trees, assists decision makers with evaluating and protecting them and creates public interest in oak issues.

When evaluating an oak for "Heritage Oak" status, usually the following items are considered:

- Is its growth vigorous?
- Are there large amounts of dead branches? This may indicate that the tree is infested by an insect or fungus.
- Are there other signs of disease? Look for mildew, mistletoe, holes, etc.

ACTIVITY 7: Evaluating and Appreciating "Heritage Oaks"

- Where is the oak located? The tree may not live long if the nearby area is an irrigated lawn or planted with water-loving plants. Oaks are drought-tolerant and can be killed by watering levels that are considered normal for other trees or plants.

- Is there heavy foot traffic or pavement nearby?

Calling attention to these old trees will give children an idea of how large their seedling trees will be when reaching maturity. Noting oak longevity will also give children perspective of how long it takes to grow an oak tree. Once oak trees establish themselves and set roots, they can get quite tall in less than 20 years. This is the same amount of time it takes a child to become an adult!

ACTIVITY PROCEDURE:

These activities help you connect the oak propagation activity to California history, mathematics and other subject areas. Do as many of these activities and extensions as time permits.

Measuring and registering a "Heritage Oak"

grades: 4-6
time: 60-90 minutes
Materials:
tape measure
skills:
observe
compare
communicate
analyze

Locate a large California oak and request permission (if necessary) to make measurements and carry out these activities.

Use a measuring tape to determine the tree's circumference measured at 4½ feet from the ground. (dbh is a unit of measurement used by foresters; "dbh" stands for "diameters at breast height"). If it is at least 100 inches in circumference, it qualifies as a "Heritage Oak." You'll need to investigate other aspects to make a final evaluation.

Working in small groups, children can gather the data, indicated on the "Heritage Oak Detective Sheet." Use this information to fill out the official "Heritage Oak" registration form and send it to the California Oak Foundation.

To help children measure tree height provide them with a copy of "How Tall is That Tree?". Using these measurement techniques can give an approximate measure of a tree's height and canopy size.

ACTIVITY 7: Evaluating and Appreciating "Heritage Oaks"

Oaks and California Place Names

grades: 3-6
time: ongoing
materials:
maps
skills:
communication
organizing
critical thinking

Many California cities, towns, streets, schools, parks and buildings use the word "oak" in their name. This again suggests the significant role oaks have played in shaping California's character.

As an additional activity, challenge children to make a list of places they know that use the word oak in its name. Use state or local maps to locate names. Introduce the two Spanish words for oak: "encino" (live oak) and "roble" (deciduous oak), to expand the list.

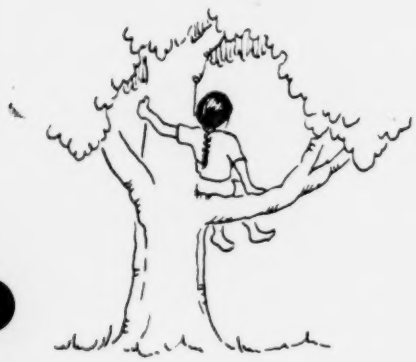
This activity can help children consider how changes in land use affect the environment. For example, in North Sacramento, a small shopping center bears the name "Four Oaks Corners." There are no trees associated with the 50-year-old complex, but oaks do grow in natural and urban settings nearby. Were there ever "four oaks?" Did they die or were they removed? What may have happened or why did the developers choose the name? Allow children to speculate on these mysteries while guiding their thinking skills.

Oaks and California History

grades: 2-6
time: 60-90 minutes
materials:
activity pages
pencils/crayons
skills:
communication
organization

Ask children to include a drawing of a boy or girl from each period of California's history on each page of the "Little Story" booklet and finish the story.

FOLLOW-UP ACTIVITIES



- Register other "Heritage Oaks" in your area.
- In California, Arbor Day is March 7, Luther Burbank's birthday. National Arbor Day is the last Friday in April. Plan an Arbor Day celebration and honor "Heritage Oaks."
- Make posters about "Heritage Oak" trees.
- Make buttons or bumper stickers that focus on oak appreciation.
- Find out about the conflict of using oaks for firewood.
- Find out if your community has an "Oak Tree Preservation" ordinance.

ACTIVITY 7: Evaluating and Appreciating "Heritage Oaks"

- Compare mass (volume and size) of an oak to a building.
- Read aloud sections of William Brewer's journal, *Up and Down California*, written in the 1860s during his historic travels in California.
- Read aloud the "Good Oak" in *A Sand County Almanac* by Aldo Leopold.
- Use creative dramatics to develop a skit that informs an audience about the importance of "Heritage Oaks" to the community.
- Find out about some of the "grand old oaks" in your county. One such tree was the Hooker Oak (now dead) in Bidwell Park, in Chico.
- Write a story or biography about your "Heritage Oak." What has the tree "witnessed?"
- Try these *Project Learning Tree* activities: "With or Without," "How Big is Your Tree" and "Tree Cookies."
- Try these *Project Wild* activities "Interview a Spider," "Wild Words," "Urban Nature Search" and "Cartoons and Bumper Stickers."
- Try *NatureScope: Trees are Terrific* activity: "Measuring up."
- Read about famous oaks in *Famous and Historic Trees* by Charles Edgar Randall and Henry Clepper.

EVALUATION:

Children successfully complete the ""Heritage Oak"" and "little story" booklet activities and include them in their "OakBook."

ACTIVITY 7: Evaluating and Appreciating "Heritage Oaks"

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American Forestry Association. "National Big Tree Register" program. Contact AFA for information.

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Name: _____

Activity 7: How Tall is That Tree?

You need a new pencil, a tape measure, and a friend to work with.

What to do:

1. Starting at the base of the tree, step backward (be careful!) and stop when you are farther away from the tree than the base of the tree is from the top. (If the tree could fall toward you, it wouldn't touch where you are standing.)

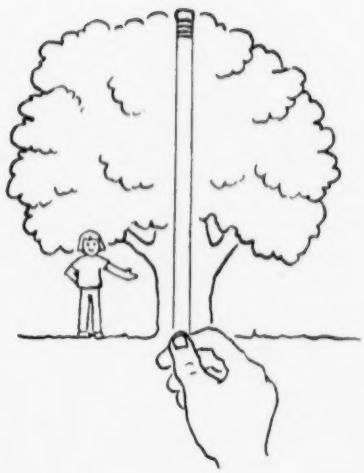
2. Ask your partner to stand next to the tree's base.

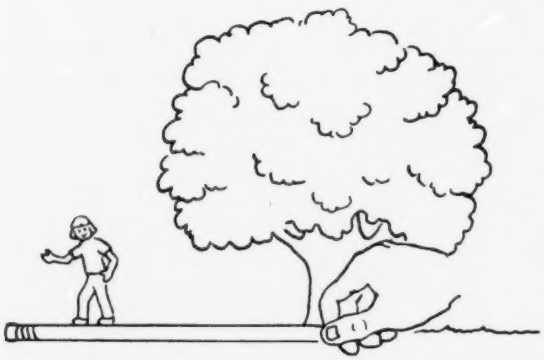
3. Hold a pencil straight up at its pointed edge. Close one eye and hold the pencil so it lines up with the tree.

4. Move yourself forward and backward until the pencil looks as tall as the tree. Then turn the pencil sideways (keep your thumb lined up with the tree trunk) so it seems as if it is lying on the ground (picture 2).

5. Ask your partner to walk away from the tree. To you it will seem as if your partner is walking along the pencil. He/she should stop when lined up with the end of the pencil.

6. Measure the distance your partner has walked (away from the tree's base). *This is about the height of the tree.* Foresters measure tree heights and diameters similarly using what is called a "cruising stick."





Heritage Oak Tree
Registration Application

Your name: _____

Address: _____

_____

Telephone: _____

Location of the "Heritage Oak":

_____

_____

Owner's name: _____

Measurements

Circumference _____

Height (approximate) _____

Variety of oak _____

Comments on trees health and condition:

_____

_____

_____

_____

Send a picture or drawing of this "Heritage Oak."

Mail To: "Seed to Seedling" Heritage Oak Registration
California Oak Foundation

Name: _____

Activity 7: "Heritage Oak" Detective Sheet

Draw a picture of your "Heritage Oak" tree on the back of this paper.	Tree's circumference is:	Name of a bird living in the tree.	Name one insect found on the tree.
Make a bark rubbing on this square. Put this paper against the tree and rub the square with a pencil.	Trace a leaf shape.	Are there other plants growing under the tree? Can you name them?	Locate a gall. Describe its shape.
Find an acorn and draw its shape.	What do you like about this tree?	About how tall is the tree?	Do you see any dead branches?
What historical event may have occurred under or around this tree?	What kind of oak is it? Write its name here.	Give directions on how to find this tree.	Who owns this tree?

Keep this in your "OakBook."

A LITTLE BOOK ABOUT AN OAK TREE

Hundreds of years ago an acorn began to grow near an Indian village

1

When the Spanish came to California the acorn had grown into a small tree.

2

Seed to Seedling

4

Today the oak tree

When gold was discovered many people came to California. One family built a house by the tree.

3

ACTIVITY 8: Planting Young Oak Trees

OBJECTIVE: Children learn how to plant their oak seedling.

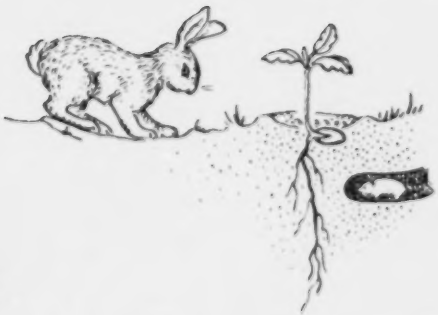
METHOD: After a group discussion, children determine an appropriate location to plant their oak seedling, prepare the site and complete the planting project.

CURRICULUM CONNECTIONS: science, art, language arts

BACKGROUND

When planting young oak seedlings or trees (October to January is best) consider the following:

- ✓ Do you have permission to plant the trees in the site you have chosen?
- ✓ Who will take care of the trees once they have been planted?
- ✓ Is there adequate space for the tree to reach maturity in the location chosen. A mature oak will need a minimum of 25 feet of "canopy" space.
- ✓ Will it have to compete with other trees and shrubs for soil, nutrients, water, light, air?
- ✓ Does the soil have good drainage?
- ✓ Will wildlife damage the seedling or young tree? Deer and cattle browse the leaves of young oaks.
- ✓ If the seedling is planted in a lawn setting, will it get too much water and need to compete with grass for soil nutrients? Oaks planted in lawns usually develop many shallow feeder roots. These trees have less chance for survival than those that form roots that help stabilize the tree and are able to locate a water supply deep within the soil.
- ✓ Oak seedlings are susceptible to the same diseases that older trees may have. If trees are planted too close together, insect pests may pass easily from one to the next. In young trees, powdery mildew and aphids are problems, especially when the trees grow in low light conditions or are crowded together.



ACTIVITY 8: Planting Young Oak Trees

Planting Guidelines

- Dig a hole twice the diameter of the container and with a depth that will measure 1-2 inches higher than the ground level when the soil and tree are positioned in the hole. Do not plant trees in holes where the tree will be lower than the soil level. Trees planted lower collect too much moisture around the trunk, which encourages the crown to rot.
- Roughen the sides of the hole to allow for root growth.
- Moisten the hole with water.
- Carefully remove the seedling tree from the growing container. Take care not to harm the delicate root system.
- Position the tree in the hole and refill the hole with the original soil. Carefully tamp the soil down to prevent large air pockets from drying out the roots. Adding soil amendments (compost, bark, peat moss) is usually unnecessary unless the soil is exceptionally poor.
- Finally, cover the soil layer around the tree's base with a 2" layer of mulch and water the tree thoroughly so that the soil will settle around the roots. Do not plant trees in very dry or soggy soil. Roots grow well in moist soil where adequate oxygen is present.

Where to plant:

School grounds (in an area that is protected and not excessively watered)

Public nature areas

Neighborhood parks

Churches

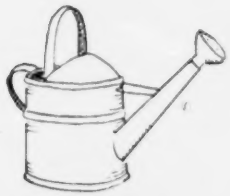
Back yards

*** Be sure to get permission ***

Other considerations:

- If trees have been kept in containers for more than one year, the roots need to be carefully loosened before being placed into the hole. Carefully straighten or cut a circling taproot. If the taproot has been severely damaged, the tree may take several months to recover from the shock of planting and side roots will take on the function of supplying moisture to the young tree.

- Mark the tree once it has been planted using three stakes placed around the outside on the root ball. A protective barrier as described in Activity 4 also works well.
- Large seedlings may require staking so that the stem will have a straight growth pattern. Most trees will establish the correct growth pattern without additional help.
- Keep competing vegetation, especially grasses, away from young seedlings. These and other plants rob soil moisture and nutrients. Scrape the weeds away in a 3-foot radius using a hoe or put mulch around the tree's base to discourage weed growth.



- Water young trees once a month during the first two summers with about 1-2 gallons of water. After that, no additional water should be necessary.

ACTIVITY PROCEDURE:

In class

grades: K-6
time: 60 minutes
materials:
blackboard
skills:
communication

Hold a group discussion using the points covered in the "background" section to help children consider the necessary steps in planning a successful tree-planting. List comments on a piece of chart paper or the blackboard. Discuss appropriate places to plant the trees and the need to seek permission to plant them at these sites. Discuss who will care for the trees after they are planted. Plan a tree-planting ceremony. See Appendix 2 for ideas.

At the planting site

grades: K-6
time: 15-30 minutes
materials:
shovel
stakes, markers
water
seedlings
water
skills:
observing

Children may need help in preparing the hole and planting their trees, especially if the soil is dry. Be sure to water the trees and provide protection with stakes or a marker. It's fun to conclude the planting activity with a ceremony.

Follow-up

grades: K-6
time: 30-40 minutes
materials:
crayons, etc.
paper
copies of "Seed to Seedling" game.
skills:
communication

Review the planting activities. Have children draw or describe each step it takes to plant a seedling. They can also draw a picture of what they think their tree will look like 20 years from now. Include this in their "OakBook." Have pairs of children use the "Seed to Seedling" game.

ACTIVITY 8: Planting Young Oak Trees

FOLLOW-UP ACTIVITIES:

- After the tree-planting, take a photograph of each child kneeling next to his or her oak seedlings.
- Plan a field trip to plant trees in a nature area or location away from school.
- Call the local newspaper (or school newspaper) to announce the arrival of new oaks in your neighborhood or school grounds.
- Invite a tree expert to help with planning your tree-planting event.
- Read aloud *The Man Who Planted Trees* or view the video version.
- Try *Project Wild* activities: "Improving Wildlife Habitat in the Community" and "Can Do."

EVALUATION:

Following directions, the children successfully choose a planting site and carry out planting their seedlings.

REFERENCES:

Bush, L., and R. Thompson. *Acorn to Oak: A Guide to Planting and Establishing Native Oaks*. Circuit Rider Productions, Windsor, CA. 1989.

"Growing Natives: Planting Oaks." *Fremontia*. 18(3). 105. California Native Plant Society. 1990.

Giono, Jean. *The Man Who Planted Trees*. Chelsea Green Publishing Co. Chelsen, VT. 1985. (Also available in video).

New Western Garden Book. Sunset. Lane Publishing Co. Menlo Park, CA. 1979.

Tree Care: A Brief Guide to the Planting and Maintenance of Trees. To obtain a copy, write the Sacramento County Cooperative Extension or California Department of Forestry and Fire Protection.

Tree Notes. Keeping the Native California Oaks Healthy. California Department of Forestry and Fire Protection. Forest Pest Management Program. Santa Rosa, CA. 1990.

ACORN TO OAK . . . GROWING

To play you will need:
- dice or numbered cards,
- a marker – try an acorn cap.

START

Roll a one to enter game.

1

2 Good crop of acorns!

3 Insects eat lots of acorns. Go back 2.

4

5 Acorn woodpeckers take acorns. Go back 3.

6 Squirrels hide acorns... some sprout and grow. Go ahead 3.

7

8 Grass fire burns seedlings. Go back 1.

9

10 Kids plant acorns in burned area. Go ahead 4.

12 Autumn leaves cover acorns.

13 Winter rains help acorns sprout. Go ahead 2.

14

15 Roots grow deep into the earth.

16

17 Cold weather! Stay here for one turn.

18 Warm weather begins. Keep growing.

19 Seedlings sprout leaves. Go ahead 1.

20

21 Dry weather. Seedlings get thirsty. Go back 3.

22

match line

GAME ... PLAY WITH A FRIEND

tape to match line

cut here

FINISH
WE ALL WIN!

NEW OAKS FOR CALIFORNIA

44 Kids gather acorns to grow at school. Go to finish!

43

42 New crop of acorns.

41

40 Young oaks provide wildlife habitat. Go ahead 2.

39 Kids pull on tree... branches break. Go back 5.

38

37 Kids protect tree with stakes. Go ahead 1.

36 Lawnmower hits tree trunk. Go back 2.

35 Seedlings grow 5 inches. Go ahead 5.

34

33 Animals nibble stems. Go back 4.

32 Insects eat leaves. Go back 3.

31

30 Kids clear weeds. Go ahead 4.

29

28 Weeds grow faster than trees. Go back 1.

27

26 Warm ground helps seedlings grow tall.

25

24 Heat wave. Leaves get sunburned. Go back 4.

23 Kids water seedlings. Go ahead 4.

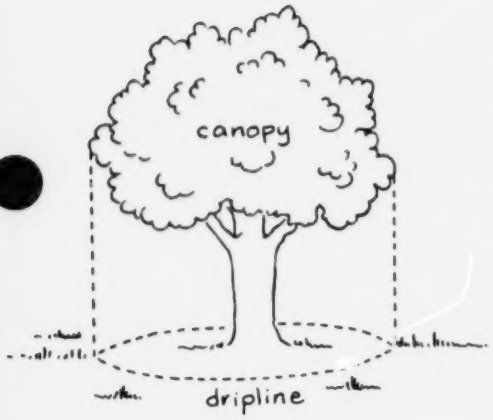
ACTIVITY 9: Caring for Oak Trees

OBJECTIVE: Children learn how to evaluate and describe the proper care of oak trees.

METHOD: Using group discussion and visual aids (slides, pictures), children learn how to care for young oak trees.

CURRICULUM CONNECTIONS: science, language arts, art

BACKGROUND: Help your children become oak caretakers. Share these tree-care ideas with them.



- Maintaining young native oaks will take very little effort. Oaks are well adapted to California's climate and soil conditions. If an oak is planted in a natural area, it will benefit with occasional deep watering (1-2 times/month) during the first three years. Oaks growing in landscaped areas must receive a small amount of irrigation, and water must be allowed to collect around its base.

- The **dripline** is the area included beneath the tree's **canopy** or **crown**. This area is circumscribed by the edge of the canopy area. The oak's major roots occur within this area. Driplines are considered to be a measure of what kinds of activities should be avoided near the tree. For example, no construction, excavation, compaction or pavement should occur within the dripline of an oak. Oaks commonly have root systems that extend well beyond the dripline.

- In general, pruning is not necessary nor recommended, and cuts on the young branches may introduce diseases. To develop vertical growth, tips of side branches may be removed. It is also important not to prune small branches toward the bottom of the trunk until after the first few years. This prevents sunburned trunks.

- Stake trees to promote vertical growth and to protect them from damage. It has been found that stakes with flexible ties supporting the trees allow the stem to move freely. Trees that are allowed to bend form stronger trunks.

- Keep weeds away from the base or dripline of the tree. Remove lawn, weeds and mulch within an 18-inch radius from the base of the tree. Remove grass growing near the tree's trunk.

ACTIVITY 9: Caring for Oak Trees

- Fertilizing young oak trees during the first year is not recommended unless there are indications that the tree has a deficient supply of nutrients. Contact a garden center for advice on what soil amendments to apply.
- Discourage wildlife, pets, machines and humans from disturbing the young oak trees. Any kind of damage to the stem may destroy the tree. Build a protective barrier or mark the trees clearly.
- With good care, some oaks species will grow 1-2 feet per year and sometimes more! Remember: To grow oaks is to invest in the future.

ACTIVITY PROCEDURE:

Tree Walk

grades: K-6
time: 60 minutes
materials:
none
skills:
observing
comparing
inferring

Take children on a "walking tour" to view trees in a school setting, park, along streets or in yards. Point out different types of trees, especially oaks. Invite a tree expert to accompany you. Examine the trees you find. Discuss "signs" that trees may be struggling or thriving.

Point out a tree's **canopy** and **dripline**. Discuss what is known about caring for trees such as keeping activities to a minimum near its dripline. Enjoy the shelter of the tree's canopy.

Discuss what may have caused wounds and scars. Look for signs of wildlife, especially insects, galls and fungi. Discuss the different ways we can care for trees (watering, staking, pruning, watching for diseases).

Follow-up

grades: K-6
time: 30-60 minutes
materials:
samples of tree-care information
crayons
paper
skills:
communication
analyzing
organization

Later, continue a discussion of how tree-care information is shared with others. Follow-up by asking children to design a poster illustrating aspects of proper tree-care. Hang these up so that others can see them.

Reproduce the "oak care booklet" and ask children to illustrate how to care for oaks. Children can share this information with others or keep it in their "OakBook."

FOLLOW-UP ACTIVITIES:

- Collect stories from magazines and newspapers about tree care (especially those that relate to oaks).
- Invite an "expert" to give a talk about proper tree care. Contact the county office of the Cooperative Extension or garden club to locate a speaker.
- Find out how a tree grows. Look at the growth rings of a tree slice (cross-section of a tree trunk).
- Try *Project Learning Tree* activities: "Tree Cookies," "City Trees," "Healing Wounds," and "Healthy and Unhealthy."
- Try the *Project Wild* activity: "Cartoons and Bumper Stickers."

EVALUATION:

Children demonstrate their understanding of how to care for trees by successfully illustrating a tree-care poster or a tree-care booklet.

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New Western Garden Book. Sunset (ed.). Lane Publishing Co. Menlo Park, CA. 1979.

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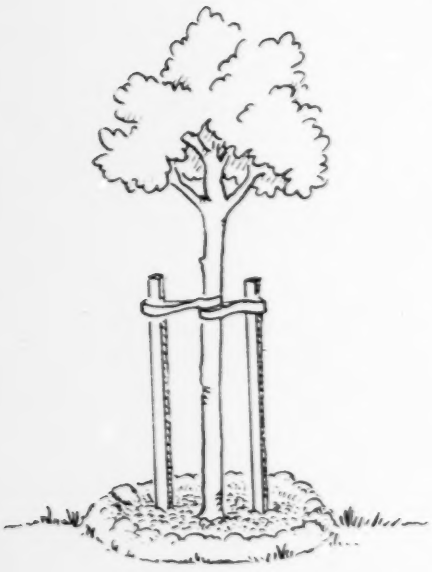


A LITTLE BOOK ON...

HOW TO TAKE CARE OF YOUNG OAKS

Give young oak trees water 1 or 2 times a month during the summer.

2

This is the best way to stake a young oak tree

3

Protect oak trees from animals and machines.

4

Seed to Seedling

ACTIVITY 10: Oaks in the Urban Forest

OBJECTIVE: Children inventory and learn how to evaluate an urban forest.

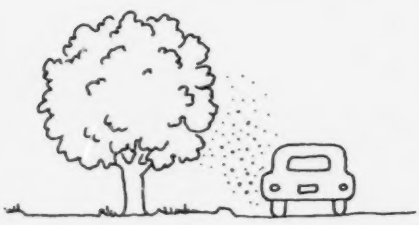
METHOD: Children walk to an area where the local native oaks and other trees can be viewed in order to understand how these trees form a "forest" mingling with the built environment. They inventory trees, analyze how the trees are arranged within the study area, and rate the forest according to five "urban tree values."

CURRICULUM CONNECTIONS science, language arts, social studies, art

BACKGROUND: The **urban forest** is a complex community of plants and animals that surround and form a canopy over buildings and streets. The most conspicuous members of this forest are the trees. Many kinds of native trees, such as oaks and sycamores, survive where urbanization or other development has not yet encroached. These and other native trees are found in canyons, along streams and in rough terrain within the boundaries of cities and towns. Trees of foreign origin, introduced for their adaptability, usefulness and beauty are also members of this forest. Urban trees line highways and streets, are found in parks, commercial areas, schools, backyards and many other places.

Trees of the urban forest are of great value to the surrounding landscape. City trees provide habitat for wildlife, play a vital role in the recycling of water and help prevent soil erosion. The importance of these trees have become increasingly apparent when we analyze their usefulness in shaping the quality of life in the urban environment. Consider these ways in which trees are important to the community:

Air Quality Control:



Air pollution is a great concern in urban areas. Traffic, construction, industrial, agricultural and home activities contribute to this problem. Trees collect dust and other particles from the air. As airborne dust blows through the crown of the trees, many particles are dropped as the wind speed is reduced. Some particles even stick to leaves. Trees act as filters by mixing their fragrances with unpleasant odors. Carbon dioxide, produced from automobiles and industrial sources, is used by the tree in the process of photosynthesis. It has been shown that many kinds of plants thrive where there is an excess of carbon dioxide in the atmosphere.

Although trees provide help in maintaining air quality, they are also sensitive to many forms of air contamination. Signs of damage due to air pollution are discolored leaves and die-back of leaves and branches. Tree health can be dramatically affected when rain, fog and snow have an abnormally high concentration of acidic chemicals such as sulfur dioxide that they can absorb. It is interesting to note that oaks seem to be tolerant to many forms of air pollution. However, many of their lichens are not.

Temperature Control: The cumulative effects of buildings, asphalt and concrete in urban areas can increase the area's average temperature by 1°F. In the summer, the difference between a hot open area and a tree-covered area can be as much as 25 degrees. At night, a forest is warmer than the surrounding open area, and provides an insulating effect over the ground and around buildings. Trees are nature's air conditioners!

Wind Control: A dense planting of trees and shrubs can reduce winds of 25 miles per hour by 75%. To combat the effects of wind, trees planted around homes, buildings, playgrounds and streets can offer valuable protection while also preventing soil erosion or other harm to both the natural and built environments.

Sound, Light and View Controls: Trees planted along streets not only beautify but filter light and noise, waves of energy that spread from their sources and never return. Sound can be absorbed, reflected or deflected by trees and shrubs. Trees planted along highways, near schools or next to parks can help reduce noise. Light glare from the sun or electric lights can be intercepted and controlled by trees that shield or reflect the light waves. Trees can also serve as barriers to slow or direct traffic and to screen views.

Wildlife Cover: Many kinds of wildlife live in urban areas and trees provide food and shelter necessary for their survival. Birds and mammals use trees both as shelters and food sources. Without adequate habitat, wildlife cannot survive.

ACTIVITY PROCEDURE:

grades: 4-6
time: 60-90 minutes
materials:
- *tree identification books*
- *tree expert*
- *survey forms*
- *pencil*
- *clipboard*
- *thermometer*
- *light meter*
- *white cloth*

skills:
- *observation*
- *communication*
- *comparing*

Hold a group discussion to describe and discuss the urban forest in your area. Talk about how the forest would appear viewed from the air. Contrast that view with one from the ground level or looking up through the trees. Help to develop an understanding of how the trees planted in and around buildings, parks and along streets as well as the natural vegetation found along streams and in open spaces together form the urban forest. Discuss how native oaks fit into the urban forest.

Locate an area such as a schoolyard or park where the "urban forest inventory" can be completed. Children will gather and analyze data by conducting the following activities:

Tree Inventory:

Survey the study area. Ask a tree expert to help with identification. Check Appendix 3 for sources of "tree experts" or use a local field guide to identify the trees found in the study area. Compile the data from the survey on the inventory provided. Younger children may enjoy collecting leaves from the different trees found. These may be useful in identifying the trees as well. Counting the tree types would extend the inventory activity. Add the inventory list to the "OakBook."

"Urban Tree Values" Analysis:

Visit the study area to evaluate the urban forest according to the list of items outlined on the "Urban Tree Values" chart. Rate each item according to the range of points given for each item outlined on the "checklist." You will need to provide a thermometer to check air temperature inside and outside the tree canopy. Similarly, if available, use a light meter to measure the amount of light intensity from within and outside the canopy.

ACTIVITY 10: Oaks in the Urban Forest

Who Takes Care of the Urban Forest:

Invite a forester or a tree expert to visit with the children. Highlight as many of these items as possible:

- What kind of special care do urban trees need?
- What problems do the trees in the urban forest have?
- How do the native oaks fit into the urban forest?
- Is it good to have an urban forest with a lot of large, old trees?
- What does it mean to have "the right tree in the right place?"
- Who takes care of the trees in the schools, parks, and along streets?
- Are there any laws protect trees in our area?
- Where can I get more information about trees?
- How can children take care of the urban forest?

Tree Map:

grades: 4-6
time: 60-90 minutes
materials:
paper
glue
natural materials
crayons, markers, paint
skills:
analyzing
comparing
inferring

Prepare a map of the study area and show where the trees are located. Use different symbols or shapes to show the different tree species. This activity may require a pre-activity or discussion on map-making and demonstration of how to draw to scale. Use natural materials such as lichens, cones, bark, sponges, or paper painted shades of green to demonstrate the different kinds of trees.

FOLLOW-UP ACTIVITIES:

- Complete a similar survey and mapping activity of the urban forest at another site.
- Learn how to draw to scale and make a tree map.
- What is a monoculture forest? What street trees planted in your area could be considered a monoculture forest? Why is a diversity of species important?
- Introduce an aerial photograph of an area that the children may know. These pictures are useful in determining the amount and kind of trees that are found in a particular area. (See Appendix 3 for an address to order aerial photographs from the U.S. Geological Service.)
- Try *Project Learning Tree* activities: "Sounds in a City and Forest," "Origin of Urban Open Spaces," "With or Without," "Start a City," "Schoolyard Safari," "Math Exercises," "Trees as Habitats," and "Rainfall and Forest."
- Try *OBIS* activities: "Mapping a Study Site" and "Plant Patterns."
- Try *City Trees* activities.

EVALUATION:

Children successfully inventory and evaluate an urban forest study area. The completed inventory and evaluation forms are included in their "OakBook."

REFERENCES:

Conner, E. Wesley. *The Backpocket Guide to Ornamental Plants.* California Polytechnic State University Foundation. 1979.

Metcalf, W. *Introduced Trees of Central Valley California.* University of California Press. (California History Series). Berkeley, CA. 1968.

Friends of the Urban Forest. *City Trees: A Curriculum Guide of Our Urban Forest and Community.* San Francisco, CA. 1988.

Watts, Tom. *Pacific Coast Tree Finder.* Nature Study Guild, Berkeley, CA. 1973.

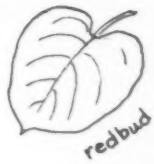
Name: _____

Activity 10: Tree Inventory Checklist:

DECIDUOUS TREES (Trees that shed their leaves in winter)

Small, under 30 feet tall when mature

____ Crape Myrtle
____ Hawthorne
____ Flowering Plum
____ Redbud



Medium, 30 to 50 feet tall

____ Chinese Tallow
____ Blue Oak
____ Buckeye
____ Chinese Hackberry
____ Gingko
____ Red or Scarlet Oak
____ Modesto Ash
____ Mulberry
____ Silk Tree
____ Sour Gum (Tupelo)
____ Tree of Heaven
____ Jacaranda

Tall, over 50 feet tall

____ Chinese Pistache
____ Cottonwood
____ European Hackberry
____ Birch
____ Plane Tree (Sycamore)
____ Blue Oak
____ Pin Oak
____ Sweet Gum (Liquidamber)
____ Tulip Tree
____ Valley Oak
____ Zelkova

EVERGREEN TREES (trees that keep their leaves year-round)

Small

____ African Sumac
____ Olive
____ Mayten
____ _____

Medium

____ Camphor Tree
____ Japanese Black Pine
____ Loquat
____ Laurel (Bay)
____ Carob
____ Scotch Pine

Tall

____ Eucalyptus
____ Holly Oak
____ Incense Cedar
____ Sierra Redwood
____ Southern Magnolia
____ Coast Live Oak
____ Interior Live Oak
____ Canary Island Pine
____ Coast Redwood
____ Colorado Spruce
____ Cork Oak
____ Deodar Cedar
____ Palm
____ _____

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Keep this in your "OakBook."

Name: _____

Activity 10: "Urban Tree Values" Checklist

Use this checklist to evaluate your urban forest.

Air Quality Control 1. Do the trees have dust on their leaves? Use a damp white cloth. Check the leaves by wiping a damp white cloth over the leaf surface. Score, using 10 for the most to 0 for the least amount. 2. Do the trees provide a pleasant odor or smell to the area? 10 scores the highest possible benefit while 0 scores the least.	
Temperature Control 3. Measure the air temperature under the trees and in an open area. Record the difference in the temperature readings and enter that number as the score.	
Wind Control 4. Are there any groups of trees in the study area (either natural or planted) that form a windbreak? If so, enter a score of 1-10 depending on how much protection is given by the windbreak. If there is no group of trees forming a windbreak, enter 0 as the score. 5. Evaluate the following and give a score of 1-10: • Do the trees have lots of branches along the trunk (1-10; most=10, least=1). • How smooth is the bark? (1-10; 1=smooth, 10=very rough) • Are there many leaves? (1-10; 1=few 10=most)	
Sound and Light Controls 6. Do the trees in the study area help control light and sound? Give a score of 1-10 for each of these. • The tree helps control sounds. • The tree helps control light glare. • The tree helps control unpleasant and distracting views from the road.	
Wildlife Cover 7. Give one point for each of these animals found in the urban forest study area: ____ scrub jay ____ owl ____ raccoon ____ ant ____ magpie ____ quail ____ centipede ____ wasp ____ robin ____ flicker ____ beetle ____ hawk ____ woodpecker ____ squirrel ____ oak gall ____ spider	
Add up the total score. If your urban forest study area has more than 100 points of "urban tree value," the forest is a great asset to community. How does yours rate?	

Keep this in your "OakBook."

APPENDIX 1: Oak Watch Ideas

Help children locate oak trees they can observe over an extended period of time. The tree, young or old, may be in their backyard, at school, in a park or nature area or along a familiar route.

Encourage them to observe their tree closely. Look at its leaves, bark, insect holes, canopy, dead branches and new growth. Help them keep an on-going record of the tree's seasonal changes. Observe the tree often, at least once a month.

Have children gather information such as:

- Find out what kind of oak it is.
- Sketch the tree's shape. Make leaf and bark rubbings.
- Make a map to show the location of the tree and its relationship to other trees, buildings, etc.
- Keep records of the wildlife (birds, insects, spiders, mammals) that visit or live in the tree. Use binoculars and field guides to help identify birds. Use a magnifying glass for examining small creatures.
- Observe bark layers for texture, thickness and color. Study how the tree's outer layers help protect the tree from injuries caused by animals, people and weather.
- Measure the tree's circumference and height (review Activity 7).
- Examine the tree closely when buds begin to form. Watch for oak flowers. Oaks have separate male and female flowers. Describe what they look like.
- If the tree produces acorns, look for new oak seedlings nearby. Some species (such as the coast live oak) are more prolific than others.
- Tie a plastic bag around a few leaves to watch how much water is transpired. Find out how the tree cycles water through its roots, stems, branches and leaves.
- Collect a leaf in the spring, summer and fall (winter if it is an evergreen oak). Press them and keep them in the "OakBook."

APPENDIX 1: Oak Watch Ideas

- Watch for signs of insect galls. Find out their names and what caused them. Keep a record of each kind that appears on your oak with accurate drawings or make a collection of galls.

- Record seasonal "tree events" that take place. What day did buds form upon the branches? When did the leaves start to fall. Did a storm break branches? When did galls start to form and the acorns ripen?

- Take photographs of the tree throughout the seasons.

- Write a story about the tree. Illustrate the story with leaf prints, rubbings, drawings, and photographs.

APPENDIX 2: Planning a Tree-Planting Ceremony

Organizing a ceremony to accompany a tree-planting can provide "windows" of opportunity for additional learning. We recommend that when tree-plantings involve children, such as Arbor Day or special commemorative occasions, that consideration be made to provide information and meaning why the new trees will become valuable components of the local environment. Furthermore when children have participated in the making of choices and decisions about the treeplanting and ceremony, they will want to take a greater role in the care and stewardship of the trees.

Consider these ideas:

- Create a sense of purpose for the tree-planting event by asking children to share their experiences and feelings about trees. Ask them to share a favorite memory or draw a picture of a tree that has special meaning to them.

- Discuss the environmental values trees provide, especially to urban environments. Children can brainstorm ideas from their own observations.

- Take the children to visit the proposed tree-planting site before the event. Together try to imagine how the new trees will change the site.

- When planning the event, have small groups of children brainstorm these considerations: Who will be invited? How long will the ceremony last? Will there be speeches or music? Should invitations be sent? What type of decorations would be nice? What tools will be needed?

- Make tree hats. Measure each child's head and cut a wide strip of construction paper to make a band. Staple the two ends together. Have children make trees out of green and brown construction paper (or draw and color a tree shape). Attach the tree to the head band.

- Use construction paper or white contact paper to make badges or stickers in the shape of a tree, leaf or acorn. Ask children to create an original slogan stating why trees are important. Wear these or give them away on the tree-planting day.

- Decorate the planting area with banners, posters and art work that celebrate trees.

- Ask children to compose poems, songs or speeches about their new trees. Let them judge which ones will be included in the tree-planting event.

APPENDIX 2: Planning a Tree-Planting Ceremony

- Select favorite books about trees or well-known poems to read to children prior to the event. Some of these tales can be used during the ceremony. Check the booklist below.
- Write tree care pledges on paper cut in the shape of a tree, leaf or acorn. These can be tied to the new tree, buried when the tree is planted or worn by the tree-planters. Help children to make pledges to take part in caring for the new trees.
- Have children make stakes or protective devices for the new trees. Add ribbons or streamers to call attention to the tree.
- Choose names for the tree (or the grove of trees) planted.
- Make a display of books about trees and related topics to have on hand during the ceremony.

Book List For Tree-Planting Ceremonies

The Man Who Planted Trees. Giono, Jean. Chelsea, VT; Chelsea Green Publishing Co., 1985. Video available form CBC Enterprises, Box 500, Station A, Toronto, Ontario, Canada M5W 1E6.

The Giving Tree. Silverstein, Shel. New York: Harper and Row. 1964. (Grades PreK-6)

Sharing the Joy of Nature. Cornell, Joseph. Nevada City, CA. Dawn Publications. 1989.

Planting Seeds, Growing Minds. Donald, Kathryn. Sacramento, CA. California Association of Nurserymen. 1991. Excellent resource for tree planting projects and tree planting ceremony ideas.

The Tree. Russell, Naomi. New York: E.P. Dutton. 1989. A picture book featuring the life cycle of an oak tree as well as the wildlife dependent upon the tree. (Grades PreK-2)

A Tree is Nice. Urdy, Janice and Mark Simont. New York: Harper and Row. 1956. (Grades PreK-2)

Pedro Y Su Roble. Levert, Claude and Carmen Sole Vendrell. Printed in Spain. 1989. Pedro adopts an oak tree and cares for it throughout the four seasons. Text in Spanish. (Grades PreK-3)

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APPENDIX 3: Resources

The following list provides addresses of agencies, organizations, and sources for additional materials available to help you with the *Seed to Seedling* project. Inquire about guest speakers, docent programs, supplies of acorns or places to visit or to plant young oaks.

Agencies:

California Department of Education. Publications Sales Unit., P.O. Box 271, Sacramento, CA 94802-0271. Request information on how to purchase the Department's curriculum frameworks.

California Department of Forestry and Fire Protection. 1416 Ninth Street, 15th floor, Sacramento, CA 95814. Obtain information about Hardwood Rangelands programs, Urban Forestry and Project Learning Tree. Contact the Forest Pest Management Program, P.O. Box 820, Santa Rosa, CA 95402-0820 for "Tree Notes."

California Department of Fish and Game. 1416 Ninth Street, 12th floor, Sacramento, CA 95814. Obtain information about the non-game heritage program (includes the wildlands and endangered species programs) and Project WILD.

California Department of Parks and Recreation. 1416 Ninth St., Sacramento, CA 95814. Obtain information about parks that include oak woodland habitats. Some parks are involved with oak restoration projects.

California State University Campuses. Many state university and community college campuses have developed arboreta and nature areas where oaks can be viewed. Check local phone directories for these contacts.

University of California. There are excellent opportunities to visit natural areas, botanic gardens and arboreta all over the state. Contact the Davis, Berkeley, Santa Cruz, and Riverside campuses for a field trip and docent programs. The University of California Natural Reserve System has many sites throughout California where oaks can be observed. Contact UC Natural Reserve System, University of California, 300 Lakeside Drive, 6th floor, Oakland, CA 94612-3560.

APPENDIX 3: Resources

University of California, Division of Agriculture and Natural Resources. For information about oaks, contact the Integrated Hardwood Range Management Program, 163 Mulford Hall, Berkeley, CA 94720. This education and research program has oak resource specialists in Mendocino, Yuba, Madera, San Luis Obispo and Riverside counties. Contact the Berkeley office for a current listing of programs, publications and audio-visual materials.

Cooperative Extension Offices by County. Check local phone directories for the location and phone number of the county branch of the University of California Cooperative Extension. Information and services may be obtained through this agency. For example, the Calaveras County 4-H program has developed the "Oak Tree Project," a step-by-step guide and accompanying video that demonstrates how to plant acorns and oak seedlings. Contact 4-H Advisor, Government Center, Cooperative Extension, 891 Mountain Ranch Road, San Andreas, CA 94549.

United States Department of Agriculture, Forest Service. Contact the Pacific Southwest Region 5 office, 630 Sansome Street, San Francisco, CA 94111 for a complete list of the 17 National Forests in California. Many of these forests manage hardwoods (including oaks), and may be able to help with speakers and sites to view the oaks.

United States Department of Agriculture, Soil Conservation Service. 2121 C Second Street, Davis, CA 94616. Contact for information concerning soil studies.

United States Geological Service. Western Mapping Center, 345 Middlefield Rd., Menlo Park, CA 94025. Request information on how to obtain aerial photographs.

Organizations

American Forestry Association. P.O. Box 2000, Washington, DC 20013. National Sponsor of the "Global ReLEAF" program.

American Forest Foundation. 1250 Connecticut Ave., NW, Washington, DC 20036. National sponsor of the Project Learning Tree program. Contact the California Department of Forestry and Fire Protection for information about the California PLT program.

California Native Plant Society. 909 12th Street, Sacramento, CA 95814. Contact the state office to receive a listing of CNPS chapters. Many chapters offer docent programs, field trips and speakers.

California Oak Foundation. 909 12th Street, Sacramento, CA 95814. Contact the state office to receive a listing of publications and programs.

California ReLEAF. The Trust for Public Land. 116 New Montgomery Street, Third Floor, San Francisco, CA 94105. California ReLeaf is a statewide affiliate to the American Forestry Association's "Global ReLeaf" program. California ReLEAF helps coordinate the efforts of many local tree planting organizations. The following is a partial list: East Bay ReLeaf, Peninsula ReLeaf, People for Trees (San Diego), Sacramento Tree Foundation, San Francisco Friends of the Urban Forest, San Jose Beautiful, Sonoma ReLeaf, Southern California ReLeaf, Tree Fresno, TreePeople (Los Angeles) and the Tree Society of Orange Co. For more information about each of these local groups, contact the California ReLEAF office.

California Association of Nurserymen. 1419 21st Street, Sacramento, CA 95816. Contact for information on how to obtain their tree and arbor day curriculum, "Growing Seeds, Growing Minds."

California Nature Conservancy. 785 Market Street, 3rd Floor, San Francisco, CA 94102. Contact for information on Nature Conservancy preserves with oaks. Field trips, docent programs and restoration projects at sites where oak trees are often offered to the public.

APPENDIX 3: Resources

Sources of Educational Materials

(excellent supplements to the *Seed to Seedling* activities)

Acorn Naturalists. 17300 East 17th St., Suite J-236, Tustin, CA 92680. Request a catalog of educational kits that includes "Western Oak Woodlands."

Cooperative Extension Publications. University of California, 2120 University Ave., 6th Floor, Berkeley, CA 94720. Request a publications catalog.

Friends of the Urban Forest. San Francisco Friends of the Urban Forest. 512 Second Street, 4th Floor, San Francisco, CA 94107. Inquire about the *City Trees* curriculum.

National Wildlife Federation. 1412 16th Street, Washington, DC 20036. Inquire about the *NatureScope* publication.

OBIS (Outdoor Biology Instructional Strategies). Order a catalog from Delta Education, Inc., Box M, Nashua, NH 03061-6012 or call 1 (800) 258-1302.

Project Learning Tree. California Department of Forestry and Fire Protection, P.O. Box 944246, Sacramento, CA 94244-2460. Request program and workshop information.

Project WILD. California Department of Fish and Game. 1416 Ninth Street, 12th Floor, Sacramento, CA 95814. Request program and workshop information.